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The Orchadian

Official Journal of the Australasian Native Orchid Society Inc.

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Plectorrhiza tridentata Photo Matt Renner

The Orchadian

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Editorial

The Covid pandemic has slowed or stopped nearly all orchid activity except in home collections and created a challenge to assemble material and produce and print the September issue of *The Orchadian* in Victoria. Regular contributors have come to the fore with a good range of interesting articles.

Mark Wapstra reviews the conservation status of *Pterostylis atrans,* described in 1994, which has had conflicting reports of abundance, and concludes that it probably qualifies as endangered under the Tasmanian *Threatened Species Protection Act 1995*. Matt Renner considers the floral morphology of *Plectorrhiza tridentata,* which has no known pollinator, and infers a mixed deceive-then-reward mode of pollination that may be investigated by observing pollinator visits. David Butler continues his reflections on a career in *Sarcochilus* breeding by looking at *S.* Velvet, containing *S. hirticalcar* which has greatly extended the flowering season for *Sarcochilus* hybrids.

Peter Adams has been studying *Dendrobium kingianum* and its influence on hybrids for 40 years and reviews the plethora of hybrids within section *Dendrocoryne* and a much smaller number of hybrids involving other sections. The influence is variable, depending on the amounts of other species present, with *D. tetragonum* having a major influence at fairly low compositions. As for other reviews of hybridisation in *The Orchadian*, the article is intended for training of ANOS judges. David James has made a long-term study of *Prasophyllum* in the Granite Belt in Queensland, and the observations reveal the difficulties in observing terrestrials and in their identification. Roslyn Capell explains nomenclature and highlights the Australasian hybrid *Dendrobium* Hawaii Spectacular, which was Grand Champion at the Sub-Tropical Orchid Council triennial orchid show in 2019.

Correction. On the back cover of Vol. 19 No. 12 there was an error in production. The legend for the photograph is *Sarcochilus falcatus* Mt. Sugarloaf, New South Wales. Also apologies to Pam Porteous for an error in her surname.

Peter Adams

President's Report

ANOS Inc. Council continues to work on key administrative issues including incorporation and insurance requirements, and progressing the project of making past issues of *The Orchadian* available online to a wider readership. The Covid pandemic is disrupting the usual calendar and activities of all ANOS groups as well as ANOS Inc. Under current restrictions and continuing uncertainty about the future of restrictions and the effect of the virus, which is variable in different states, it has not been possible to schedule a date for the Annual General Meeting. Council has taken legal advice and is informed that alternative processes to the usual face-to-face AGM must provide equity to all members. As a significant number of members do not have capacity to join a meeting at a distance, such as an online meeting and ballot, there are further obstacles. We are all hoping that things will improve and normal processes can resume. In the meantime everyone must keep to the guidelines, stay well and help to bring a resolution to these extraordinary problems as soon as possible.

Members will be informed of progress and when a date for the AGM can be set. In the meantime production of *The Orchadian* and normal council meetings are proceeding.

Peter Adams

Below are some *Dendrobium kingianum* seedlings flowering mid to late September 2020. Photos P. Adams

D. kingianum 'Queen's Jewels' x 'Coolstrappa'

D. kingianum 'Best 2009' x 'Jacques Miller'

D. kingianum 'Queen's Jewels' x 'Pale Maid'

D. kingianum 'Coolstrappa' x 'Finest 2007'

Pterostylis atrans D.L.Jones in Tasmania: Distribution and Conservation Status

Text and Photos Mark Wapstra | mark@ecotas.com.au

Abstract

The distribution of *Pterostylis atrans* D.L.Jones in Tasmania is reviewed by reference to database records, collections held at various herbaria and other sources. The conservation status of the taxon is reviewed. The species has a widespread but disjunct distribution in Tasmania, with ca. 25–30 populations seemingly well-reserved but with usually low population abundance. The taxon probably qualifies as endangered under the Tasmanian *Threatened Species Protection Act 1995* (criterion D: less than 250 mature individuals).

Key words. *Pterostylis atrans*, Tasmania, distribution, conservation status, threatened, endangered.

Introduction

Pterostylis atrans (Plates 1a–2b). was described in 1994 (Jones 1994) as a reasonably distinct member of the genus. At the time of description, its distribution was described as "widely distributed in southern New South Wales, Australian Capital Territory, Victoria and Tasmania" and its habitat as "typically occurs in high rainfall regions and usually grows in tall forests in the ranges and foothills… in some localities it may also extend to coastal woodlands" (Jones 1994). In *The Orchids of Tasmania* (Jones et al. 1999), the distribution and habitat was described as "uncommon and localised in eastern half of Tasmania, including Flinders Island, favouring hilly and montane areas up to 800 m" and that "it may be more widespread than indicated by the map because of its similarity to *P. decurva*".

Prior to the description of *Pterostylis atrans* (Jones 1994), material now attributable to the taxon in Tasmania was usually identified as *Pterostylis obtusa* R.Br. In *The Tasmanian Flora* (Rodway 1903), the taxonomic concept of *P. obtusa* R.Br. included what we now include as *Pterostylis decurva* R.S.Rogers and *Pterostylis atrans* D.L.Jones. In *Native Orchids of Tasmania*, Firth (1965) appears to have included *P. obtusa* in the concept of *P. decurva* R.S.Rogers. In *The Student's Flora of Tasmania* (Curtis 1979), *P. obtusa* R.Br. was included, as was *P. decurva* R.S.Rogers.

As part of a broader review of the Orchidaceae in Tasmania, the opportunity is taken to review the distribution, collecting history, populations and conservation status of *Pterostylis atrans* in Tasmania.

Methods

The Tasmanian Department of Primary Industries, Parks, Water & Environment's (DPIPWE) *Natural Values Atlas* (NVA) database was interrogated for records of *Pterostylis atrans* (DPIPWE 2020). The NVA includes records from various sources including collections held at the Tasmanian Herbarium (HO) and records from national databases such as the *Atlas of Living Australia* (ALA). However, both the ALA and Australia's Virtual Herbarium (AVH) were also interrogated for additional records not held in the NVA. The public Facebook group *Tasmanian Native Orchids* was also reviewed, and several "posters" contacted direct for additional information.

The collection of *Pterostylis* at HO was examined: this included all collections attributed to *Pterostylis atrans* but also those attributed to *Pterostylis decurva*. Determination slips were added to specimen sheets where required. Data was managed in Excel and transferred to ArcGIS for review.

Results and discussion

Data sources

Examination and collation of different data sources is a useful exercise to demonstrate the value of not relying on a single source. For example, prior to any "data cleaning" and re-detting of specimens at HO, the ALA, AVH and NVA held 87, 33 and 61 records from Tasmania, respectively, all with various levels of duplication. In terms of vouchered specimens, HO (24), QVM (9), MEL (6), AD (3) and NSW

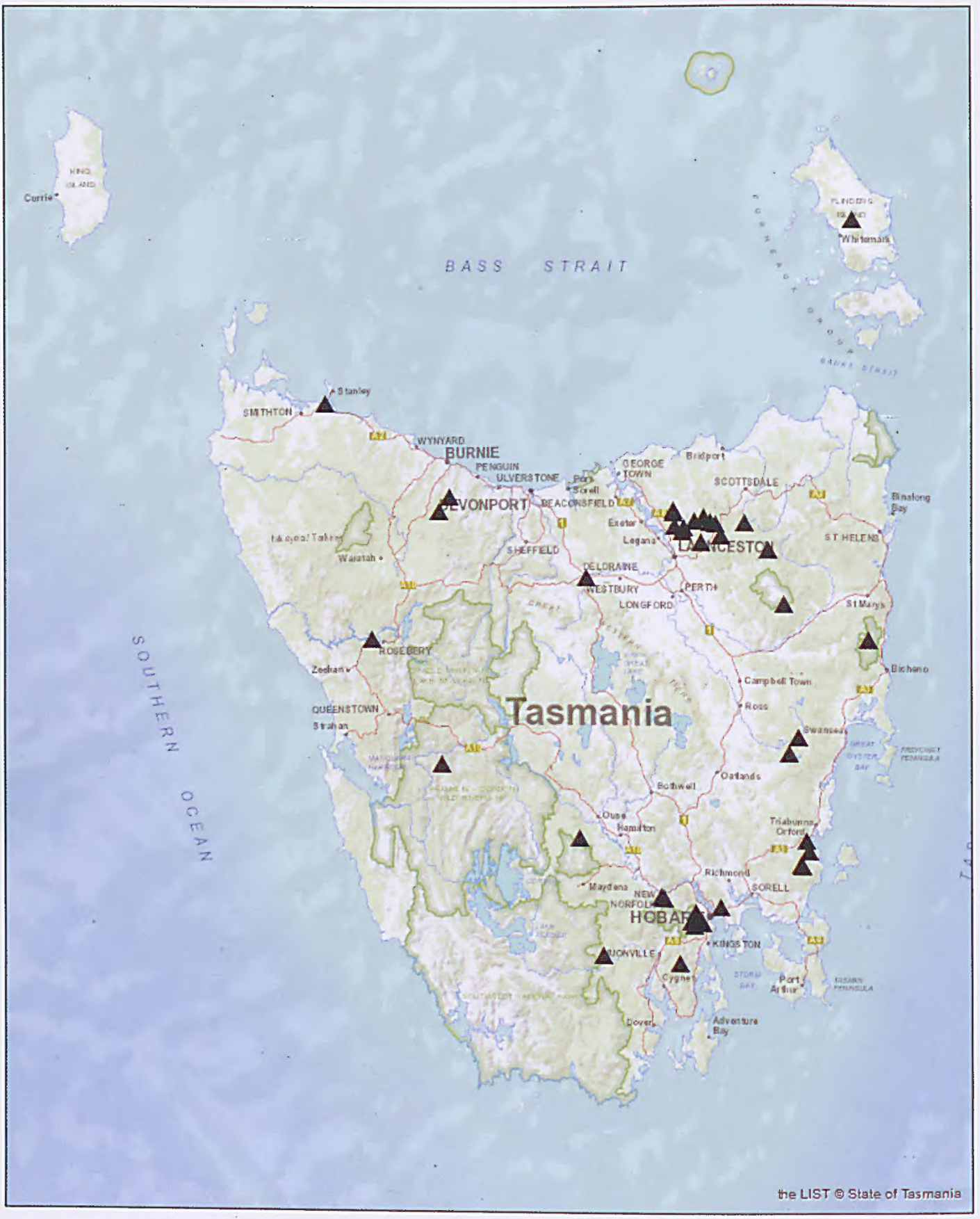

Figure 1. Distribution of *Pterostylis atrans* in Tasmania (all sources combined and "cleaned" for presentation)

(3) all hold specimens as indicated in parentheses. Of the 31 NVA records that are supported by vouchers, 22 are held at HO (the ALA indicates that HO holds 24) and 9 at QVM.

Any review of the conservation status of a taxon requires careful consideration of multiple data sources. Reliance on an obvious data source (e.g. vouchers at the local herbarium or database managed by the State agency) provides only a partial picture of the collecting history and distribution of a species. In the case of *Pterostylis atrans*, reliance on HO and/or the NVA would have missed several key historical sites well outside the geographic range indicated by only those sources.

Collection history

Pterostylis atrans was first collected (as *P. obtusa*) in Tasmania by R.C. Gunn in 1836 in the Circular Head area (a broad area centred on the Smithton–Stanley part of the northwest coast), although there is some doubt on the identity of the collection as it is purportedly from well outside the peak flowering period (Wapstra 2018). Other early collections include Pieman River (A. Simson, 1879), Deloraine (A. Simson, 1881), Barron Pass (R.S. Rogers, 1928) and Ben Nevis (G.E. Perrin, 1928). Collections from widespread parts of Tasmania continued sporadically, with most collections from the 1970s. The most recent formal collections are from 2011 (from near Hobart and on the east coast). The public Facebook group *Tasmanian Native Orchids* (which was started in January 2014) included reference to six additional sites for the species, only two of which were previously known (general Mount Wellington and Snug Tiers area), all post-2012.

Distribution and habitat

Pterostylis atrans has a widespread but disjunct distribution in Tasmania (Figure 1, Table 1). It has an extent of occurrence (minimum convex polygon) of ca. 56,325 km^2 (although this reduces to ca. 36,800 km^2 if the Flinders Island outlier is excluded), occurring from low elevations (mostly around 100–300 m a.s.l.) through to higher elevations (highest record around 1,000 m a.s.l.). The species occurs mainly in eastern Tasmania with apparent disjunct clusters of records in the southeast, east, central north and northwest with one record from central Flinders Island. The species occurs in all but the Central Highlands (previous record attributed to Perrin from Middlesex Plains re-detted to *P. decurva*) and Northern Midlands bioregions (Environment Australia 2000) of Tasmania (Table 1).

While most records are not accompanied by habitat notes, the species appears to prefer moister shrubbier forests dominated by species such as *Eucalyptus delegatensis* and *Eucalyptus obliqua*, but it also extends to dry sclerophyll forest dominated by *Eucalyptus viminalis* and *Eucalyptus tenuiramis*. Most sites are nominally on Jurassic dolerite (an igneous intrusive rock) but this may simply be a reflection of the widespread occurrence of dolerite in eastern Tasmania because the species also occurs on Permian mudstone and Devonian granodiorite.

Populations

While the distribution of collections and database records indicates a widespread (albeit disjunct) distribution, the available information suggests a relatively low number of subpopulations, perhaps in the order of 25–30 (depending on veracity of records). Most collections and database records are not accompanied by notes on extent or abundance; those that are usually indicate less than 20 (mostly less than 10) individuals. Jones (2006) suggests that the species is "sometimes locally common": personal experience suggests the species usually occurs as single individuals or in very low numbers occupying an area of a few square metres.

Possible hybridisation with *Pterostylis decurva*

Jones (1998) suggested that "sporadic hybrids may occur between *P. atrans* and *P. decurva* where the two grow in close proximity", a concept first mooted by Curtis (1979) who stated (in relation to *P. obtusa*) "rare, recorded from Flinders Island and southern Tasmania near New Norfolk… in the latter locality *P. obtusa* grows with *P. decurva* and here, also on Mount Wellington at the altitude of c. 900 m, apparent hybrids between these 2 spp. are found". At present, HO does not hold any specimens formally attributed to hybrids between *P. atrans* and *P. decurva*. However, the geographic, elevational and habitat range of the species overlaps considerably, as does the flowering period (Wapstra 2018), and there are collections that are somewhat intermediate between the two taxa, especially in terms of flower size, length of apical extension to the galea and degree of development of the sinus "platform". Fresh material will be needed to confirm the degree of hybridity in these taxa as curated material is generally inadequate for that purpose.

Reservation status

The virtual absence of precise collection locations for most records (whether vouchered or otherwise) makes a review of the reservation status of the species challenging. Its conservation status was described as "widespread and well conserved" (Jones 1994) but this clearly related to its Australia-wide distribution not only Tasmania. Jones (1998) indicated that the species "is apparently uncommon in Tasmania" but indicated possible confusion with *Pterostylis decurva*. Jones et al. (1999) suggested that the species "is poorly represented in reserves but occurs in Douglas Apsley National Park" (that statement based on a single unvouchered collection from 1993 with scant details). Based on collections with reliable location notes (Table 1), we can now indicate that the species is formally reserved in the Snug Tiers Nature Recreation Area, Weld

No.	Location	Source	Comments
Flinders IBRA			
1	Walkers Lookout [Flinders Island]	HO111525 & MEL0563328A (J.S. Whinray, 25 Jan. 1968)	Darling Range Conservation Area. Also MEL2317022A (Whinray, 6 Nov. 2004); MEL2316284A, MEL2317060A, & NSW808879 (Whinray, 4 Dec. 2004); MEL2119075A (Whinray, no date)
King IBRA			
2	Circular Head	AD98802068 (R.C. Gunn, 25 May 1836)	The collecting date of 25 May 1836 suggests the specimen is not *P. atrans*, which is a summer-flowering taxon (det. by D.L. Jones, 2007).
Northern Slopes IBRA			
3	Natone Forestry Reserve	NVA1087397 (B. Dudman, R. Hay, 5 Jan. 2010) & Tasmanian Native Orchids public Facebook group (R. Hay, 18 Jan. 2016)	State forest (Permanent Timber Production Zone Land); "15 blooms" in 2010 & "5 blooms" in 2016 (J. & N. Colgrave pers. comm.).
4	Blythe River	QVM:ND:B:0336 (M. Cameron, Jan. 1995)	No details.
5	Deloraine	HO514653 (A. Simson, 9 Nov. 1881)	7 specimens on sheet (originally identified as *P. obtusa* and then re-detted to *P. decurva* in 2002, some specimens have some affinities to *P. decurva* – possible hybrids?
West IBRA			
6	Barron Pass	AD97718526 (R.S. Rogers, 25 Jan. 1928)	Franklin-Gordon Wild Rivers National Park.
7	Pieman River	AD97718525 (A. Simson, Dec. 1879)	No details.
Ben Lomond IBRA			
8a	Mount Scott	QVM:1990:B:0004 (R. Smith, 17 Feb. 1990)	Mount Maurice Regional Reserve?
8b	Mount Scott	Field notebook of Les Rubenach (6 Jan. 1993)	Mount Maurice Regional Reserve Les Rubenach's field notebook (H. & A. Wapstra pers. comm.) provides reference to this site as follows: "On Mt. Scott. Go on to East Diddleum Rd. off Diddleum Plains Rd. then on to Sowters Rd. to the start of the walking track. Up the track to the finish of the myrtle forest treeline which is just short of the "tops" (not the true summit).....*P. obtusa* & *P. decurva* both can be found among the open shrubbery".
9	near Storys Creek	HO111908 (M.J. Firth, Feb. 1964)	Future Potential Production Forest (most likely).
10	Ben Nevis	HO503213 (G.E. Perrin, 20 Jan. 1929)	Future Potential Production Forest (most likely).
11	Whites Mill Road	HO535893 (M.F. Duretto, A. Chuter, A. Pennington, Dec. 2005)	Future Potential Production Forest.
12	slopes of Mt Arthur	NSW223884 (N.E. Burrows, 26 Jan. 1956)	Mount Arthur Regional Reserve?
13	Turners Marsh	QVM:1934:B:0005 (H.B. Atkinson, Dec. 1934)	No details.
14	Mount Barrow Road	QVM:1989:B:0001 (J. Campbell, 7 Jan. 1989)	Mount Barrow Falls State Reserve?
15	Myrtle Bank (Lorenz property)	QVM:1986:B:0046 (H. Ronken, 4 Jan. 1986);	Presumably all from same approximate site.

Table 1. Distribution of *Pterostylis atrans* in Tasmania.

No.	Location	Source	Comments
		QVM:BP:B:0132 (M. Cameron, 6 Jan. 1986); QVM:1986:B:0051 (M. Cameron, 18 Jan. 1986); NVA564578 (L. Rubenach, Jan 1980); NVA553623 (T. Timothy, 13 Jan. 1986)	Les Rubenach's field notebook (H. & A. pers. comm" provides specific directions to sites supporting *P. atrans* (e.g. "5-1-86 I went to the Targa area to the property of [name omitted here] with Harry Ronken to look for Pterostylis obtusa as per directions from Terry Timothy. We found about ten plants but only three were mature" and "6-2-93 Pterostylis obtuse On the property of [name omitted here] near Targa. Drive out Targa Road until you reach the top of the hill then turn left and drive to the property at the end of the road. There is a walking track that leads down from the house area down to a farm dam. A few P. obtusa along the track not long after reaching the damp forest (down the hill a little), also a very few nearer the dam. Early to mid January"). Examination of the State's LISTmap reveals the utility of this type of field notes as the sites mentioned would all be very easily re-located. The dates mentioned are difficult to reconcile with dates mentioned on collections and in NVA records but this is likely to be a database management issue only.
16	Patersonia near Patersonia Rivulet	QVM:1986:B:0053 & QVM:BP:B:0133 (M. Cameron, 18 Jan. 1986)	No details.
17	No details but placed near Holloways Hill near Lilydale Road ± 100 m	NVA563961 (M. Cameron, Jan. 1990)	Database record only without any details. Dubious if this is genuinely a separate subpopulation (given the general location, much more likely to refer to the Patersonia-Myrtle Bank-Targa sites).
18	No details but placed near Bouchers Creek near Lilydale Road ± 100 m!	NVA553048 (unknown, Dec. 1946)	Database record only without any details. Dubious if this is genuinely a separate subpopulation (given the general location, much more likely to refer to the Patersonia-Myrtle Bank-Targa sites).
19	No details but placed on Pipers River Road ± 100 m	NVA552892 (unknown, Dec. 1971)	Database record only without any details. Dubious if this is genuinely a separate subpopulation (given the general location, much more likely to refer to the Turners Marsh site).
South East IBRA			
20	Douglas Apsley [between Mayson River and Douglas River]	NVA554956 (P.A. Collier, Jan. 1993); NVA359503 (P.A.Collier, 7 Nov. 1996)	Douglas-Apsley National Park.
21	Colonels Hills	HO323731 (M. Askey-Doran, Dec. 1991); HO323733 (D. Ziegeler, 24 Dec. 1991)	Informal reserve on public land (State forest). Considered to be collection duplicates (with marginally different dates and grid references).
22	Tooms Lake	Diary notes of Ron Williamson (26 Dec. 2001)	Future Potential Production Forest or possibly Tooms Lake Conservation Area. From the diary notes of R. Williamson (H. & A. Wapstra pers. comm": "Boxing Day 01. Continued on to Tooms Lake & just as we topped the main hill & turn off to the left we found P. decurva and P. atrans in flower…".
23	Orford	HO589499 (M. Allan, 21 Feb. 1976)	No details.
24	Three Thumbs	HO323740 (D. Ziegeler, 12 Feb. 1992)	Three Thumbs State Reserve.
25a	State forest coupe WT019D, Wielangta Hill area	NVA1227607 (M. Wapstra, 25 Feb. 2011)	Future Potential Production Forest; 2 plants.

Table 1. (Contd.) Distribution of *Pterostylis atrans* in Tasmania.

No.	Location	Source	Comments
25b	State forest coupe WT017E, Wielangta Hill area	NVA1227608 (M. Wapstra, 25 Feb. 2011)	Future Potential Production Forest; 2 plants.
26	Merton Fire Trail, Limekiln Gully Reserve area	HO551905 (M. Wapstra, 4 Jan. 2009)	Wellington Park; 6 plants.
27	Huon Road, Upper Waterworks Reserve, Hobart	HO565262 (M. Wapstra, 2 Feb. 2011)	Informal reserve on public land (City of Hobart); 2 plants.
28a	Mount Wellington [unknown location]	HO112059 (P. Palmer, 2 Jan. 1968) & HO112066 (27 Dec. 1970) NVA564150 (A. Moscal, Jan. 1970) & NVA56149 (R. Williamson, 18 Nov. 1990)	The Palmer material is curated as "cultivated" but all notes suggest both were from somewhere on "Mount Wellington" although the precise location is not known. The Moscal and Williamson records are not supported by vouchers and presumably were communicated to the database through personal communications with orchid experts during the 1990s.
28b	Mount Wellington [Lenah Valley Track near Springs]	Tasmanian Native Orchids Facebook page (K. Butterley, 23 Jan. 2020)	Wellington Park; 3 plants (K. Butterley pers. comm.).
28c	Mount Wellington [Pipeline Track]	Tasmanian Native Orchids Facebook page (S. Primrose, 16 Jan. 2016)	Unknown tenure; 3 plants.
29	Meehan Range	Tasmanian Native Orchids Facebook page (G. Curry, 13 Dec. 2017 & 2018)	Meehan Range Nature Recreation Area; ca. 20 plants over 100 m.
30a	Lachlan Road	HO112067 (W. Knight, B.G. Reid, Dec. 1970)	This appears to be a separate collection to HO112072 but the labelling is confusing. The location on HO112067 is given as "Lachlan Road. Fosters Gully near New Norfolk" but a separate note indicates the collection was from "c. 2000'") and Fosters Gully does not reach above 160 m a.s.l., suggesting it was collected further up Lachlan Road.
30b	Fosters Gully near New Norfolk	HO112072 (B.G. Reid, 3 Jan. 1970)	See notes above.
Southern Ranges IBRA			
31	Weld River crossing	M. Wells pers. comm. (17 Dec. 2012)	Weld River Regional Reserve; 2 plants.
32	Brown Mountain near Broad River	HO324406 (K. Williams, 14 Jan. 1991)	Informal reserve on public land (State forest).
33a	Snug Tiers	HO541266 (J. Janes, 6 Feb. 2006)	Snug Tiers Nature Recreation Area; 7 plants (3 in flower).
33b	Snug Tiers	Tasmanian Native Orchids Facebook group (K. Martin-Smith, 7 Jan. 2014 & 6 Jan. 2017)	Snug Tiers Nature Recreation Area; 1 plant in 2014 and 3 (1 in flower, 2 in bud) in 2017 (K. Martin-Smith pers. comm.).
34c	Snug Tiers	ORG 537 (Wapstra, 25 Jan. 1997) & NVA556749 (H. Wapstra, A. Wapstra, 13 Jan. 1997)	Snug Tiers Nature Recreation Area. Jones (1998) cited "ORG 537, Wapstra, 25 Jan. 1997" but this does not correspond to any database records or herbarium collections. It is, however, the correct date when a single specimen of *P. atrans* was collected and sent to David Jones for his review (H. & A. Wapstra pers. comm.) i.e. NVA556749 should be dated 25 not 13 Jan. 1997.

Table 1. (Contd.) Distribution of *Pterostylis atrans* in Tasmania.

River Regional Reserve, Douglas Apsley National Park, Wellington Park, Mount Barrow Falls State Reserve, Mount Arthur Regional Reserve (possible), Mount Maurice Regional Reserve (presumed), Franklin-Gordon Wild Rivers National Park, Darling Range Conservation Area, Meehan Range Nature Recreation Area and Three Thumbs State Reserve.

Several populations occur on what is usually referred to as "State forest", some of which has been transferred to the authority of the Department of Primary Industries, Parks, Water & Environment (DPIPWE) as "Future Potential Production Forest (notionally "reserved" in a moratorium on commercial wood production that was lifted in 2019). Other sites on State forest occur within "Informal reserve on public land", usually some form of permanent set-aside linked to the Management Decision Classification system of the land manager, Sustainable Timber Tasmania (Orr & Gerrand 1998).

Additional populations may occur on sites on public or private land subject to some level of conservation management but this cannot be determined reliably from the available collection notes.

While the species appears to have a relatively high level of formal and informal reservation, reservation per se does not impose any specific management requirements that are likely to be beneficial to the species. In most cases, in the absence of a formal threatened status, there is virtually no requirement to take account of a species (e.g. if the Weld River bridge needed replacing, a fire trail needed upgrading, etc.).

Conservation status

As part of an informal review of the conservation status of species of *Pterostylis* in Tasmania, Janes et al (2008) suggested that *Pterostylis atrans* may qualify as rare (Schedule 5) on the Tasmanian *Threatened Species Protection Act 1995* (DPIW 2008). Since that suggestion, there have been only ca. 6–8 additional subpopulations reported, mainly from southeastern and eastern Tasmania. While the species is widespread and there are several reported locations, the low population abundance strongly suggests the species would qualify as endangered (Schedule 3) under Criterion D (total population extremely small or area of occupancy very restricted), specifically, D1 (total population estimated to number fewer than 250 mature individuals). Even if the number of point locations were tripled with further familiarity of the species, the total state-wide population is highly unlikely to exceed 250. That said, the disjunct distribution, combined with somewhat brief flowering period, suggests that the species may simply be widespread and rarely abundant. However, on present information, loss of even one or two sites could place the species in an apparently more uncertain position.

Reporting of novel locations (with detailed habitat and population details) is strongly encouraged. Monitoring of previously reported locations is also considered prudent to determine the statewide status of the species (as many such sites are represented by a single collection/database record with no supporting details). An extremely cautious approach to the management of any sites known to support the species is advocated.

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Hans & Annie Wapstra and Lorilee Yeates reviewed the draft manuscript. Malcolm Wells, Geoff Curry, Jill & Neale Colgrave, Keith Martin-Smith and Karen Butterley provided information on various sites. Staff of the Tasmanian Herbarium (HO) provided access to the collection.

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Plate 1a. *Pterostylis atrans* Meehan Range. Photo G. Curry

Plate 1b. *Pterostylis atrans* Merton Fire Trail. Photo M. Wells

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Wapstra M (2018) *Flowering Times of Tasmanian Orchids: A Practical Guide for Field Botanists*. Self-published (Fourth Edition, July 2018).

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Plate 2a. *Pterostylis atrans* Weld River. Photo M. Wells

Plate 2b. *Pterostylis atrans* Weld River. Photo M. Wells

Fool Me Once: Do *Plectorrhiza tridentata* (Lindl.) Dockrill Flowers Deceive Then Reward Their Pollinators?

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Summary

Flower structure may provide clues to the mode of pollinator-flower interactions, and hypotheses about the deposition and delivery phases of pollen transfer may be derived from flower structure. *Plectorrhiza tridentata* flowers possess a range of unusual micromorphological structures that are considered in terms of putative functional roles in guiding pollinator movement to achieve pollen delivery on the stigma, then pollen deposition on the pollinator in sequence. A mixed deceive-then-reward mode of pollination is inferred, wherein a blind tube at the front of the flower serves to deceive the pollinator to effect pollen delivery, before the pollinator is rewarded by a nectar spur, whose access requires the pollinator to move up and further into the flower, so coming into contact with the rostellum. This mixed mode pollination system is novel and hypothetical and requires confirmation against observations of pollinator visits to *Plectorrhiza tridentata* flowers.

The pollinator of *Plectorrhiza tridentata* is unknown.

Key words: Pollination, orchid, floral deceit, reward, micromorphology

Introduction

For a range of reasons, outcrossing results in higher reproductive output than inbreeding (Willis 1999; Stephenson et al. 2000; Borba et al. 2001). Many animals and some plants guarantee outcrossing by having separate male and female individuals (dioecy), but most plants are monoecious, so encourage outcrossing by separating male and female parts in space or time (Lloyd & Webb 1986; Bertin & Newman 1993). Within single flowers this can be achieved by having male and female phases at different times, which is a strategy employed by many flowering plants (Lloyd & Webb 1986). In protandrous (male-first) flowers the pollen sacs mature first, and are positioned in the middle of the flower to maximise contact with pollinators, then when the flower enters the female phase the filaments bend outward and the style grows and matures to occupy the space where the anthers were. Protandry is exhibited by many Australian plants, for example Lamiaceae such as *Prostanthera* (Guerin 2005), and occurs in some orchids, including the Spiranthinae (*Spiranthes australis*) (Catling & Catling 1991) and Goodyerinae (*Zeuxine oblonga*), both of the subfamily Orchidoideae (Singer & Sazima 2001). However, in most orchids the anther and receptive stigma are simultaneously mature, so flowers must spatially separate male and female parts. This is often achieved by fixed placement of stigma and anther on a rigid column, between which is a physical barrier called a rostellum, a modified portion of the median stigma lobe.

For most orchids pollination and seed production involves animals moving pollen around the physical barrier formed by the rostellum, usually between flowers. Not all, of course, but many *Thelymitra* species have friable pollen and self-pollinate, and *Danhatchia australis* may not have a rostellum at all. In this article I consider the details of flower structure in *P. tridentata*, an epiphyte for which there is no known pollinator, to look for clues to the mode of pollination.

Pollinator Rewards

The trick for the orchid is in persuading animals to visit flowers. Many orchids offer a food reward like nectar as incentive encouraging pollinator visits, and advertise this reward, like most flowers do, with colour and scent (van der Pijl & Dodson 1966; Dressler 1981, 1993). Orchids present floral nectar in different places: nectar may be completely exposed on the labellum as in *Listera* spp.; presented in a cup-like hypochile as in *Epipactis* spp.; but usually it is contained within a floral spur, as in *Platanthera* spp. (Jersáková et al. 2006). Other nutritional rewards offered by orchid flowers include oils, for example in *Disperis* spp. (Steiner 1989, 1991), pollen (Kocyan & Endress 2001), and various forms of pseudopollen including starch-filled cellular projections

as in some *Dendrobium*, *Eria*, *Maxillaria* and *Polystachya* (Davies et al. 2013; Pansarin & Maciel 2017). *Gastrodia procera* produces a mass of pseudopollen on each side of its labellum which may serve as a nutritional reward. Floral fragrances, a non-nutritional reward, are produced by *Catasetum, Clowesia* and *Cycnoches* (van der Pilj & Dodson 1966; Milet-Pinheiro & Gerlach 2017) and are gathered by male euglossine bees.

Many orchids offer no reward: the flowers deceive pollinators into visiting on false pretenses. Of the about 9,500 pollinator-deceptive plant species known, fully 8,000 of those are orchids, meaning around one-third of orchids deceive their pollinators (van der Pijl & Dodson, 1966). The deception may involve visual cues, scent, or both, and there are many kinds of deception. Food deceit often involves orchids presenting brightly coloured, sometimes scented, flowers that are often similar in size, shape and flowering time to rewarding flowers. These flowers capitalise on pollinator behavior and search images to attract individuals into multiple visits of deceiving flowers. Studies of pollinator behavior have demonstrated that when presented with a choice, bees tend to avoid flowers with lower sugar concentrations in their nectar than flowers with lower or no nectar volume (Cnaani et al. 2006). This makes sense in some ways because an individual flower with no nectar might by chance have been visited shortly before by another bee, so there is no reason the next flower will not have nectar. Many species of *Diuris* and *Caladenia* may be assisted by these foraging strategies.

Sexual deceit involves the fascinating situation where orchid flowers mimic females in looks and smells to attract males into visiting the flower, some of which result in males copulating with the flower (Coleman 1928, 1929; Nilsson 1992; Peakall & Beattie 1996). There are many orchids that mimic females, some of the most impressive are orchids with hinged labella, which not only mimic females but capitalise on the males proclivity to fly off with his flightless mate to effect pollen transfer, for example *Drakaea* (Hopper & Brown 2007). Other sexually deceptive orchids actively trap males within the flower, for example, *Pterostylis* (Phillips et al. 2014). Other well-known examples of sexually deceptive orchids include *Cryptostylis* and many *Caladenia* and *Chiloglottis* species.

Brood site deceit is an interesting strategy of rewardless pollination. *Corybas* species may mimic the mushrooms where female midges deposit their eggs, or provide a rendezvous site for males and females, or both (Kelly et al. 2013). Some *Paphiopedilum* species, including *P. rothschildianum* and *P. barbigerum*, are thought to mimic the brood sites where female syrphid flies lay their eggs (Cribb 1998; Shi et al. 2009). In that effort, females fall into the bucket from which they can only exit by crawling up the inside of the labellum so passing under the column, exiting out either side. Unlike other orchids, the Cypripedioideae have two fertile anthers, one on either side of the column.

More unusual forms of pollinator deceit include roost site deceit, though this might not actually be deceit because pollinators do roost inside the flowers. Mating site deceit in *Dracula* species nearly perfectly mimics the form of basidiomycete fruiting bodies, mushrooms; and antagonism, for example in some Oncidiinae, is thought to mimic the males of territorial bee species, such that flowers are attacked by males in their efforts to defend territories from competitors (Dressler 1993),

There is more to pollination than convincing a pollinator to visit a flower twice. During the flower visit, the pollinator has to be persuaded to orient itself appropriately to ensure two things happen: one, pollen is picked up from the flower; and two, pollen is delivered to the stigma, but not necessarily in that order. Pollination can then be thought of as a process wherein the flower not only attracts pollinators to visit, but also guides the movement of the insect during that visit to achieve pollen transfer between flowers. And the trick is in guiding pollinator movements to ensure flowers are not fertilised by their own pollen, despite the simultaneous maturity of male and female parts So how is that outcome avoided?

In orchids, pollen deposition and delivery are highly targeted. This is critical because orchids are often pollinator-limited, meaning visits by pollinators are rare events so orchids maximise the likelihood of achieving fertilisation on each flower visit.

Orchid flower structure, texture, and pigmentation all interact with a pollinator as it moves through the flower, in a manner that reduces the risk of self-pollination. During its visit a pollinator will, depending on the flower, exit by a different opening from that by which it entered and move forwards through the flower, or the pollinator will exit by the same opening through which it entered but have to reverse out to leave. In broad terms, orchid flowers can be divided into two categories on the way pollinators move through flowers: one-way flowers and two-way flowers.

Figure 1. *Plectorrhiza tridentata* flowers in front (a), back (b) and oblique (c) views.

Figure 2. *Plectorrhiza tridentata* flower detail (a) close up of flower in frontal view showing pigment spots, entrance to blind tube, entrance to nectary surrounded by long mamillae, the stigma, and then the rostellum in order from bottom to top; (b) flower in oblique view from above showing the horn-shaped rostellum whose viscidium is presented above and forward of the stigma; (c) longitudinal section of the nectar spur exposing copious nectar; (d) pollinarium showing viscidium attached to tweezer apex, caudicle and pollinia; (e) a closer view of the flower from front; (f) labellum margin showing tall mamillae on margins and surface.

In one-way flowers, outcrossing is achieved by separating the anther(s) and stigma along the directional path taken by the pollinator through the flower, and by placing the stigma first. For example, in *Cypripedium*, *Paphiopedilum*, and *Phragmipedium* pollinators exit the flower through a pinch point where they pass under the stigma before passing under the anther (Li et al. 2008). By this mechanism, receipt of pollen from previously visited flowers is guaranteed before the flower's own pollen is deposited on the pollinator. Similarly, when escaping from the *Pterostylis* spring-trap, pollinators climb the column and pass the stigma before encountering the anther (Bernhardt 1995; Phillips et al. 2014). In *Pterostylis*, wings on the column guide the pollinator as it climbs and the pinch-point is formed by the labellum that, when sprung, snaps tight against the column. In one-way flowers, pollinators

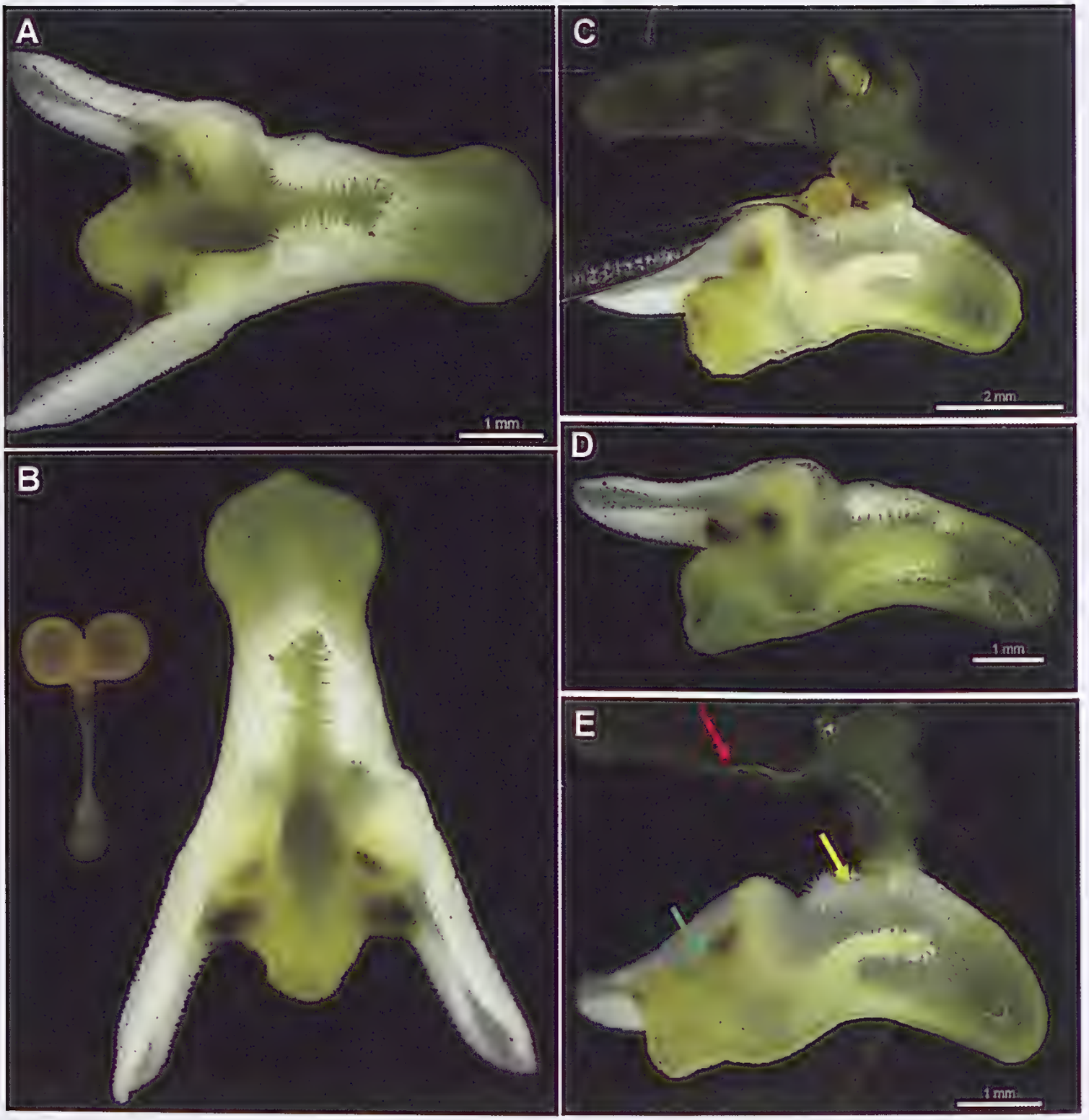

Figure 3. *Plectorrhiza tridentata* flower parts and sections (a) labellum in oblique view, showing pigment spots, blind tube, and nectary entrance; (b) comparison of labellum and pollinarium lengths, showing equivalence in distance between blind tube and labellum-column junction and the pollinarium stipe length, the stigma sits immediately above the labellum-column junction; (c) longitudinal section of flower with pollinarium imposed in hypothetical delivery position when carried by a pollinator, showing the viscidium positioned over the blind tube, and pollinia in contact with the stigma; (d) longitudinal section of the labellum showing blind tube, tongue, and lateral projections above the nectary entrance; (e) longitudinal section of flower showing the relative positions of the blind tube (green arrow), nectary entrance (yellow) and rostellum (red), note position of stigma over nectary entrance.

pick up the flower's own pollen after they have passed over the stigma. Pollen transfer is a two-step process; pollen deposition refers to flowers depositing pollen on a pollinator, and pollen delivery refers to flowers receiving pollen from a pollinator.

In most orchids, pollen deposition occurs as pollinators are leaving the flower (van der Cingel 1995), but one general difference between one- and two-way flowers may be the direction of pollinator movement when pollen is placed on the pollinator. In one-way flowers, pollen deposition occurs as the pollinator moves forward toward the exit. In two-way flowers, pollinia or polliniarum deposition occurs when the pollinator backs out of the flower (e.g. Cheng

et al. 2009), when the reversing insect induces contact with the previously concealed viscidium by tripping or otherwise interfering with the rostellum or anther-cap, and in reversing, withdraws the pollinarium from the anther.

Plectorrhiza tridentata

Plectorrhiza tridentata is a small tangling branch and twig epiphyte in rainforests and wet sclerophyll forests, often growing in association with waterways, along the central and southern eastern coast of Australia. I am not aware of any reports of pollinator activity in *P. tridentata*, and this along with few reports in Australian Aeridinae is intriguing. The plant is monopodial, with widely remote leaves and sparingly branched shoots. A pendulous inflorescence bearing up to twelve small, widely spaced sweetly fragrant flowers is produced from axillary nodes, and two or three may be borne simultaneously by a single shoot. Nothing is known about the pollination of *P. tridentata* (Adams & Lawson 1993) except that the flowers are not self-pollinating (Jones 1988). However, we can hypothesise about the pollination process by considering floral morphology given the flower is a tool to modulate pollinator behavior. The flowers of *Plectorrhiza tridentata* are intricate, so we'll begin by considering their structure in detail.

Flower structure

The inner surface of lateral petals and sepals and dorsal sepal are dark, nearly charcoal brown, with hints of green on their outer surface, though some individuals have dull green petals and sepals (Fig. 1). All segments are linear to lanceolate, plane or concave on inner surface, especially the lateral sepals, and dull coloured, ranging from brown to green. In contrast, the labellum has a clear crystalline white base colour, except for the nectar spur that is green, and the labellum mid-lobe that has a yellow base colour. The labellum bears five brown spots, two on each side and one in front of a tube-like depression on the mid-line of the labellum and at the base of the labellum mid-lobe between two raised and papillate thickenings at the base of each lateral lobe (Figs 1a,c; 2a). Pigments form visual cues to guide pollinators into flowers, so let's call these spots 'nectar guides'. The labellum lateral lobes are in-rolled over the upper labellum surface, forming imperfect tubes one end of which opens adjacent to the lateral pair of pigment spots (Fig. 2a, b). The medial tube-like depression is blind (Fig. 3). In a longitudinal section of the labellum we see that the inner side is formed by a thick tongue of tissue that extends rearward into the nectar spur (Fig. 3c-e). This 'tongue' is also covered by mamillose cells and these are particularly tall along the labellum midline and toward the tongue apex. On each side of the labellum above the tongue there is a triangular thickening also bearing tall mamillae (Fig. 3a, b). The rounded apex of this triangular projection is oriented toward the labellum apex, its hypotenuse along the outer margin of the labellum, in the vicinity of the join with the column-base. The apex of the tongue extends into the nectar spur slightly further than these lateral projections. The nectar spur is formed by a projection of the base of the labellum (Fig. 3) and contains nectar (Fig. 2c). The nectary entrance is bounded by long mamillae, and is located immediately below the elliptic, recessed stigma bounded by a wine-red pigmented rim (Fig. 2e). The stigma is 1.0-1.2 mm wide and is covered with a viscous fluid. Above and forward of the stigma is a horn-like projection from the column that is the rostellum, at the apex of which is the shield-shaped viscidium (Fig. 2b, e). The viscidium is part of a pollinarium comprising a stipe 1.2 mm long, a caudicle to the apex of which two pairs of fused hard pollinia are attached (Fig. 2d). The pollinia sit side-by-side and together are around 1 mm wide. After being extracted from the flower, the stipe dries and its margins recurve, but the orientation does not change. The pollinia are held at a shallow angle above a horizontal plane defined by the viscidium. Hard pollinia like those found in *Plectorrhiza tridentata* are deposited in a single event, one or both of the pollen masses are captured by the stigmatic fluid and removed whole from the pollinia (Burns-Balogh & Bernhardt 1985). Bear in mind the preposterous size of the target for the pollinia: the stigma is about 1- 1.4 mm^2 and is literally just hanging around in the forest.

The flowers of *Plectorrhiza tridentata*, then, have a number of interesting features that we can seek to explain in terms of pollinator interaction, if we think such an exercise fruitful.

First, why is there a medial tube-like depression at the base of the labellum mid-lobe? Second, when the nectary opening is at the back of the flower, why are there five pigment spots, which may be nectar-guides, at the front of the flower and around the tube-like depression? Other interesting features of the flower are the pollinarium stipe being more or less the same length as the distance from the medial depression to the stigma cavity (Fig. 3b); the two dimensional separation of the stigma and viscidium, the viscidium is much closer to the front of the flower and much higher than the stigma, which as noted above, is lower down and near the back (Figs 2, 3).

A pollination sequence?

One thing we can do at this point is to imagine a pollinator approaching and landing on the flower. Which pollinator? For argument's sake let's say a small rainforest inhabiting solitary bee, some 5 mm in length. The bee's approach to the flower is guided by a combination of floral architecture and pigmentation. The tepals make an approach from the rear or side difficult: while they may not contribute to visual display by the flower, they do form effective barriers to flower entry from the side (Fig. 1c). The white labellum with its pale lemon mid-lobe and the five pigment spots is clear when viewed from the front (Fig. 1a). Let's assume the bee approaches the flower from the front, and alights on the flower, possibly holding onto the outermost projections of the labellum, and moves up the labellum toward the back of the flower to access the nectary, in doing so comes into contact with the apex of the rostellum and its viscidium. As it backs out of the flower, it withdraws the pollinarium and flies off with it attached, perhaps to the top of its head, perhaps to the upper side of its thorax between its wings. The pollinarium stipe then dries and hardens and holds the pollen masses ahead and slightly above the horizontal.

When the bee encounters another flower and alights upon it, the pollen masses project ahead of it and are well placed to contact the stigma when the viscidium is over the labellum blind-tube. The hard pollen masses will approach and contact the stigma before the bee has moved forward and upward toward the nectary opening (Fig. 3c), and so before it has contacted the rostellum of this new flower. For that to occur, the bee must be oriented with a high degree of precision to ensure the pollen mass is inserted into the stigmatic cavity, and the bee has to hold that position long enough for the pollen mass to become trapped within the stigmatic fluid. Do the nectar guides and blind tube facilitate this? Perhaps, if the bee is encouraged to pause to seek nectar in the blind tube this enhances the chance of successful pollen deposition and pollinium entrapment. We don't know for sure, but the concerted architecture of flower and pollinium are highly suggestive.

If visitors to *Plectorrhiza tridentata* flowers are first deceived by a blind nectar tube during pollen delivery, then rewarded after moving further up and toward the back of the flower, a movement that results in contact with the rostellum and pollen deposition as the bee leaves the flower, this would mean a highly unusual mixed-mode pollination strategy is employed by *Plectorrhiza tridentata*. In other orchid flowers, pollinators are either deceived or rewarded. Orchid flowers may be doubly deceptive (Davies et al. 2013). However, there don't appear to be any reports of both deceit and reward mechanisms being employed in apparently deliberate conjunction with different stages of pollen transfer within single flower visits, as inferred here: deceit on delivery and reward on deposition.

These inferences of pollinator-flower interaction in *Plectorrhiza tridentata* can be tested against observations of pollinator visits to flowers. Unfortunately, these visits are probably rare events, and sophisticated recording and sensing equipment, in conjunction with a bit of luck and good management, will be required to obtain data on how pollinators interact with flowers.

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Some Thoughts on *Sarcochilus* Velvet

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Introduction

For many years *Sarcochilus* breeding involved crossing together the large-flowered, showy species and their hybrids, most of which are spring-flowering, growers being content to tend their plants all year in anticipation of this event. *Sarcochilus* plants did flower at other times but these were small-flowered and often difficult to maintain in cultivation. One of these, *Sarcochilus hirticalcar*, was introduced into breeding programs resulting in the primary hybrids *S.* Nicky and *S.* Riverdene which were then crossed to make *Sarcochilus* Velvet. So began a new wave of hybridising which by 2010 saw *Sarcochilus* plants flowering at various times throughout the year.

Originally written in 2010, this article appears never to have seen the light of day, either then or more recently, but is worth dusting off and up-dating. The intervening ten years have seen the sporadic benching of *Sarcochilus* hybrids become a distant memory, it now being taken for granted that no matter the time of year a benching of native orchids will include a class for *Sarcochilus* hybrids.

Sarcochilus Velvet

As noted, the parents of *S.* Velvet are *S.* Riverdene and *S.* Nicky, each having *S. hirticalcar* in its make-up. This double dose of *S. hirticalcar* is the reason *S.* Velvet usually flowers in late summer/early autumn, but the grower may find plants flowering in any season, with some plants seldom out of flower. Also inherited is the sequential flowering habit with up to twelve flowers open at first, followed by fewer open at the same time until flowering is finished. The racemes are quite long by the time the last flower opens. Further, the *S. hirticalcar* inheritance increases labellum size and renders flowers resistant to *Botrytis* attack.

Plants of *S.* Velvet are reasonably compact and tidy, although not overly keen to form side-shoots. The thick white roots can ramble widely and be difficult to contain in a pot. The strongly epiphytic nature of the *S. hirticalcar* parentage no doubt influences root habit and the way the plants should be grown, so for pot culture *S.* Velvet prefers a very open, free-draining potting medium. Otherwise

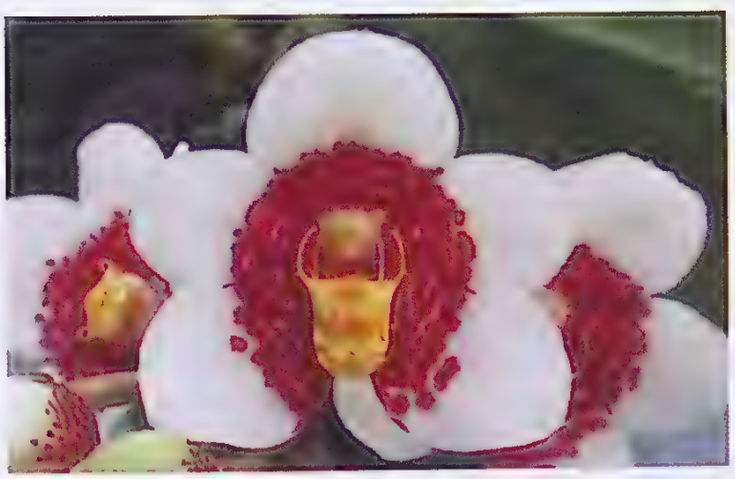
Sarcochilus Velvet 'Nice Light Yellow'

Sarcochilus Velvet 'Warm Brown'

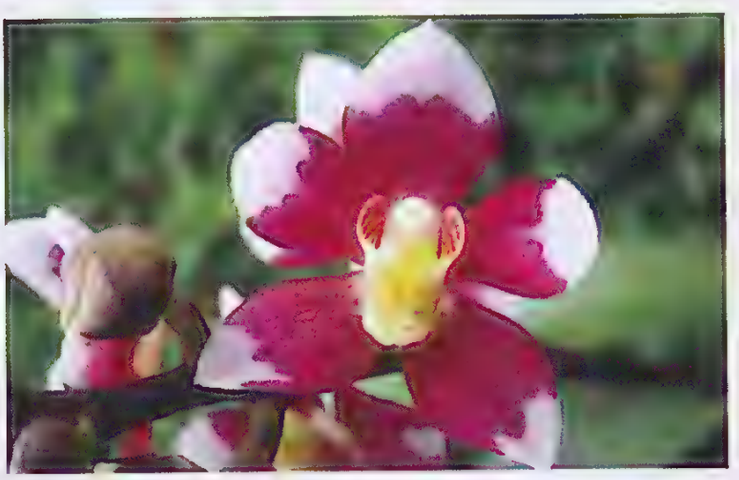
Sarcochilus Velvet 'Warm Brown'

Sarcochilus Velvet Dawn 'Golden Glory'

Sarcochilus Bessie 'Sweet Lime'

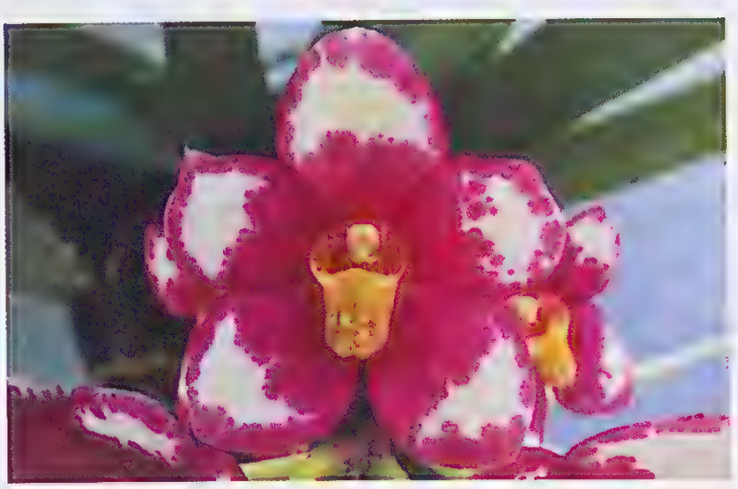


Sarcochilus Bessie 'Red Centre'



Sarcochilus Cindy

Sarcochilus Bonanza 'Cool'



Sarcochilus Lustrous 'Nice'

roots may rot, a problem overcome by mounting the plants, this being the method preferred by some growers. When pot-grown the plants are sometimes hung or attached to the side of the bush house to maximize air movement, and it is not unusual to find many of the roots dangling in the air.

The Beginning of Breeding with *Sarcochilus* Velvet

Neil Finch (Down Under Native Orchids) crossed a fully red *S.* Nicky with the cream-coloured *S.* Riverdene 'Holly' (cross no. 828) and registered the hybrid as *Sarcochilus* Velvet (N. Finch 1998). I was fortunate to obtain several seedlings, one of which, *S.* Velvet 'Cool Dude', was to become an important parent, producing *S.* Bessie and others. A selfing of *S.* Velvet 'Cool Dude' was named *S.* Velvet 'Warm Brown' and it become a notable parent (e.g. *S.* Surprise). There were other sibling crosses and selfings, many of which displayed a greater range of colours than their parents and helped to increase the availability of *S.* Velvet plants. It may be worth noting that when *S.* Velvet is crossed with *S.* Velvet the result is still *S.* Velvet.

Hybrids with *Sarcochilus* Velvet as a Parent

Sarcochilus Velvet has been used extensively in hybridizing. There are 31 hybrids named to date, 10 with *S.* Velvet as the seed parent and 21 as the pollen parent. Breeding with *S.* Velvet is not always straightforward as it can take time to assess the individual traits of parent plants. Some breed readily while others like to be the pollen parent or the pod parent but not both, making plants such as *S.* Velvet 'Cool Dude' valuable because they breed readily in both directions and produce worthwhile progeny.

Why do we use *S.* Velvet in hybridizing if it does not have a clumping habit, is a progressive flowerer, and can be a little demanding to grow? The main reasons are that it flowers in the autumn and that it passes on its large labellum to its progeny. Less desirable traits can be overcome by combining *S.* Velvet with parents which are easy growers and clump readily.

Some *Sarcochilus* Velvet Hybrids

S. Amelia (*S.* Duno Nickys Twin x *S.* Velvet)

The flowering habit follows the *S.* Velvet parent, with heavy-textured flowers opening a few at a time as the raceme extends. Breeding with *S.* Amelia 'White Tips' as a parent has produced quality offspring in bright reds and yellows which are capable of flowering at any time of year.

S. Bessie (*S.* George Colthup x *S.* Velvet)

The clearly defined colours and robust nature of the flowers make *S.* Bessie a most rewarding hybrid both as a show plant and as a parent. *Sarcochilus* Bessie 'Buttermilk' AM/OCNZ (*S.* George Colthup 'Divine' x *S.* Velvet 'Cool Dude') was OCNZ Orchid of the Year in 2013.

S. Bonanza (*S.* Fitzhart x *S.* Velvet)

With its array of colours and ability to flower throughout the year, *S.* Bonanza is a favourite with many growers.

S. Cindy (*S.* Elise x *S.* Velvet)

The smaller flowers and compact plant habit give *S.* Cindy a daintiness which many growers find attractive.

S. Lustrous (*S.* Velvet x *S.* Elegance)

The name is an apt description of the showy flowers in their many colours and patterns, highlighted by a velvet sheen. Well-flowered, *S.* Lustrous is an imposing hybrid.

S. Marina Harriott (*S. ceciliae* x *S.* Velvet)

This hybrid is similar to *S.* Cindy in many ways, with flowers in a variety of remarkable colours and with distinctive foliage inherited from the *S. ceciliae* parent.

S. Soft Touch (*S.* Velvet x *S. hartmannii*)

These were nice but unremarkable except for *S.* Soft Touch 'Ginger Brown Centre', which has been a consistent show winner, and champion on at least two occasions. The plant, now several years old, remains a single growth which each year produces four uniform racemes with the flowers all open together and of a colour which invariably draws attention. Plant height is reduced every four years by removing some of the older roots and stem and repotting in new medium. It poses a question as to the longevity of *Sarcochilus* plants which never produce side growths.

S. Surprise (*S.* Galaxy x *S.* Velvet)

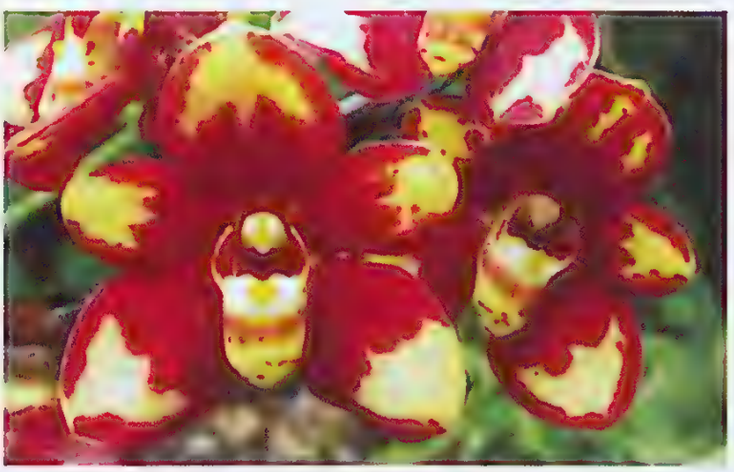
The name says it all. This is a hybrid which is seldom out of flower, as a new raceme appears before older racemes finish. The flowers are cute and often audaciously coloured in combinations of red and yellow.

S. Velvet Dawn (*S.* Aussie Dawn x *S.* Velvet)

This hybrid is now fifteen years old but has been given

Sarcochilus Surprise 'Bright Red'

Sarcochilus Soft Touch 'Ginger Brown'



Sarcochilus Surprise 'Bright Red'

Sarcochilus Galaxy x *Sarcochilus* Amelia seedling

Sarcochilus Galaxy x *Sarcochilus* Amelia seedling

Sarcochilus Surprise 'Pinky Cream'

Sarcochilus Marina Harriott 'JH'

a new life now there is a show class for novelties. A floriferous nature and golden flowers have helped *S.* Velvet Dawn 'Golden Glory' become a valued parent.

Looking back

Successful crosses which have *S.* Velvet as a parent, such as the hybrids shown above, are but an early part of the continuing improvement of *Sarcochilus* flowers year-round. However, while each new development is exciting, it may be timely to reflect on these original plants which were so instrumental in showing that one day even the most casual grower may enjoy *Sarcochilus* flowers all year. Their other contribution goes further back to the original *S. hirticalcar* with its disproportionately large labellum, a characteristic passed down with good effect to many of the hybrids we see today.

David Butler is a well-known hybridist of Sarcochilus *in New South Wales for many years.*

The Significance of *Dendrobium kingianum* Bidw. in Hybrid Breeding

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Summary

Dendrobium kingianum is a component of over 1200 registered hybrids and has been regularly used as a parent since the first Australian hybrid, *D.* Specio-kingianum was registered in 1892. It has been crossed with more than 100 species to make primary hybrids and is present at levels >80% in 20 hybrids. Hybrids with >50% *D. kingianum* are usually dominant for most characteristics of the species and the influence is still present at 25–50%. There are only small numbers of hybrids with species of sections of *Dendrobium* other than sect. *Dendrocoryne*, indicating low compatibility. Hybrids with non-Australian parents are possible but rarely successful, and there may be scope for developing new lines. The number of quality awards for the hybrids in both ANOS and AOC is low. The trend in recent years has been towards higher quality awards for hybrids, often associated with high background composition of *D. speciosum*.

Introduction

Dendrobium kingianum hybrids are amongst the most common in section *Dendrocoryne* and generally show the dominance of *D. kingianum* characteristics, especially at compositions >50%. *Dendrobium* Specio-kingianum, better known as *D.* Delicatum, was the first *Dendrocoryne* hybrid registered in 1892, followed by *D.* Ellen by W. Schmidt in 1928. Other section *Dendrocoryne* species were crossed with *D. kingianum* in the first wave of Australian *Dendrobium* hybridisation, with Bill and Jean Cannons responsible for most of the primary hybrids (Table 1). The positive influence on shape, floriferousness and vigorous growth under cool conditions was appreciated from the initial results, particularly with show standard *D.* Delicatum, *D.* Bardo Rose and *D.* Ellen, but *D.* Hastings seedlings were often slow to grow and with low flower counts.

A *D. kingianum*-style hybrid may be defined as a cool growing, compact, generally short floriferous plant with floral features that are strongly influenced by the species, that is, with a well presented half rounded to triangular shape with broad segments in a wide range of colours and colour patterns. The predominant colour ranges from white through mauves to deep purple. Less commonly there is yellow, blue-mauve, and green which can be introduced in breeding with other species and hybrids.

A search was made for species that had not been used with *D. kingianum* to make hybrids, and for the incidence of inter-sectional and unusual *D. kingianum* hybrids. The inheritance of characteristics from parents is complex and not simply related to the background percentage composition of species. Nevertheless, in the absence of clear predictors, hybridists continue to use these percentages as a rough guide to predicting outcomes in breeding programs. In this article, an overview of the use of *D. kingianum* in hybridisation programs is presented with detailed consideration of its influence and a view to future directions in breeding. The contribution of *D. kingianum* in registered hybrids and the quality awards for *D. kingianum*-style hybrids in the ANOS and AOC judging systems are analysed.

Incidence and Scope of *Dendrobium kingianum* Hybrids

There are over 12,000 registered *Dendrobium* hybrids and the 6,000 containing *D. bigibbum* are the largest subgroup. Of the total, 1266 involved *D. kingianum*, so that *D. kingianum* is a significant species in the composition of cool growing hybrids, along with *D. speciosum*. There are 50 hybrids with >75% *D. kingianum* in their background (Table 2). *Dendrobium* Pink Snow and *D.* Rutherford Bluetongue at 94% background *D. kingianum* are virtually indistinguishable from *D. kingianum*. The 20 hybrids with >80% background show a strong dominance of *D. kingianum*. In hybrids with 50–75% *D. kingianum* in the background, the species is influential in most but not all characteristics.

In hybrids with 25–50% *D. kingianum* in the background it is often still influential. Hybrids with <25% *D. kingianum*

Sect. *Dendrocoryne* species	Registered hybrid with *D. kingianum*	Breeder, Year of Registration	Comments
D. adae	*D.* Tooloom	Brandon 1983	Few hybrids
D. aemulum	*D.* Emmy	I. Butler 1966	Few hybrids
D. callitrophilum	-	-	Often no capsules produced
D. falcorostrum	*D.* Bardo Rose	H. Overall 1961	Also made by Cannons
D. finniganense	-	-	Often no capsules produced
D. fleckeri	*D.* Hastings	W. and J. Cannons 1970	
D. gracilicaule	*D.* Suffusum		Cady, 1964 discovered the natural hybrid
D. jonesii	*D.* Ella V. Leaney	D. Cannon (W. and J. Cannons) 1980	
D. moorei	*D.* Moorking	Unknown breeder 2020	
D. speciosum	*D.* Delicatum (syn. *D: Specio-kingianum*)	Lawrence 1892	Registered as *D. Specio-kingianum*
D. tetragonum	*D.* Ellen	Schmidt 1928	Also made by Cannons

Table 1. Primary hybrids of *Dendrobium kingianum* with sect. *Dendrocoryne* species.

Percentage *D. kingianum*	No. Registered Hybrids	Dominance of *D. kingianum*
>75%	50	Dominant
>50% – <75%	143	Usually influential
>25% – 50%	438	Variable influence
<25%	593	Usually non-dominant

Table 2. Percentage of *Dendrobium kingianum* in registered hybrids.

Other Parent	*Dendrobium* Section	Registered Hybrid	Breeder, Year of Registration
D. johannis	sect. *Spatulata*	*D.* Brinawa Flame	Jarvis, 1992
D. bigibbum	sect. *Phalaenanthe*	*D.* Esme Poulton	Poulton 1978
D. bowmanii	sect. *Rhizobium*	*D.* Flighty	Fisher, 2000
D. monophyllum	sect. *Monophyllaea*	*D.* Karani	Brandon, 1983
D. teretifolium	sect. *Rhizobium*	*D.* Pink Pencil	His and Hers, 1996
D. striolatum	sect. *Rhizobium*	*D.* Striking	Upton, 1984

Table 3. *D. kingianum* as a parent in Australian inter-sectional *Dendrobium* hybrids.

Other Parent	*Dendrobium* Section	Registered Hybrid	Breeder, Year of Registration
D. cunninghamii	sect. *Macrocladium*	*D.* Malcolm Campbell	M. Campbell, 2005
D. sanguinolentum	sect. *Dendrobium*	*D.* Tsiku Serena	Tsiku Taiwan Orchids, 2003

Table 4. Hybrids between *Dendrobium kingianum* and non-Australian *Dendrobium* species.

are usually derived from further breeding of *D. kingianum* primary hybrids away from the species, so that each successive generation has less *D. kingianum* component and the influence is progressively lost. There is a wide range of hybrids with *D. kingianum* in their background, especially with amounts below 50%.

In the Yarra series, *Dendrobium* hybrids were crossed back to improved line-bred *D. kingianum* (Adams 2018). The Yarra hybrids are compact, with moderate flower counts of quality white-purple flowers, often with large fine purple-speckled labellums. Several have received quality awards. There is a group of *D. kingianum*-style hybrids with 16-84% *D. kingianum* background that have attractive classic *D. kingianum* shape and deep purple markings, influenced by *D. tetragonum*. A review by Adams (2018) found that >6% *D. tetragonum* background in a *D. kingianum* hybrid introduces several other characteristics, notably purple floral markings.

Hybrids with Other Dendrobium Section *Dendrocoryne* Species

Key species used initially were *D. falcorostrum*, *D. fleckeri*, *D. gracilicaule*, *D. speciosum* and *D. tetragonum* (Table 1). These lines now extend for many generations and in different directions, and it is difficult to see the future directions. There has been less activity with *D. adae*, *D. aemulum* and *D. jonesii*. *Dendrobium callitrophilum* and *D. finniganense* flower in early summer and have proved difficult to set seed capsules, perhaps related to very warm weather in December. Repeat attempts at making hybrids with them may be worthwhile. Flower counts of these species are low, but they may offer extension of the flowering season and the prospect of yellow flowers. The newly registered hybrid *D. kingianum* x *D. moorei* (*D.* Moorking) flowers in early spring in Victoria and has rather lax racemes with mauve flowers that are not of special note. These flower in winter due to the influence of *D. moorei* (Lord Howe Island) which flowers from March to July.

Australian Intersectional Hybrids

There are six registered Australian intersectional hybrids - three with sect. *Rhizobium* and one each with sect. *Phalaenanthe*, sect. *Spatulata* and sect. *Monophyllaea* (Table 3). The best-known hybrid is *D.* Esme Poulton (*D. kingianum* x *D. bigibbum*) which flowers in spring and reportedly made only once despite many attempts. *Dendrobium kingianum* influence is dominant, and plants will grow in cool conditions. *Dendrobium monophyllum* x *D. kingianum* (*D.* Karani) is attractive and resembles *D. monophyllum* more than *D. kingianum*. It flowers at various times of the year. There is a deep mauve and a lemon-yellow flowering plant sourced from nurseries in the Port Macquarie area in the 1980s, and there may be other colours in collections. They tend to be slow growers in the southern parts of Australia.

The sect. *Spatulata* species, *D. johannis*, has been used to make *D.* Brinawa Flame. Crosses of sect. *Rhizobium* species with *D. kingianum* tend to grow very slowly and may not flower for years or at all e.g. *D.* Strioling and *D.* Pink Pencil. Plants may have strange and folded leaves that resemble sect. *Rhizobium*. Overall, the yield for intersectional hybrids is low and it is unknown how many unsuccessful attempts have been made and whether it is worthwhile persisting.

Dendrobium kingianum and Non-Australian Species as Parents

There are two registered hybrids with non-Australian species as a parent (Table 4). These involve *D. cunninghamii* (sect. *Macrocladium)* from New Zealand, and *D. sanguinolentum* (sect. *Dendrobium*) from Thailand, Malaysia and Indonesia. This raises the possibility of making hybrids with attractive classic *Dendrobium* species in sect. *Dendrobium* which has been attempted with limited success (M. Thongsomboonranathon, pers. comm.). There is potential for innovative new lines using these more distantly related species, but low compatibility is expected.

Australasian Native Orchid Society Inc. Awards for *D. kingianum*-Style Hybrids

Dendrobium kingianum-style hybrids are represented in low numbers in ANOS awards compared with hot/cold hybrids, *D. speciosum*-style hybrids and other hybrids such as those in sect. *Rhizobium*. There are eight quality awards from 1995–2019 with background *D. kingianum* of 25–95% (Table 5). They all received HCC/ANOS quality awards with the exception of *D.* Australian Rhubarb Pie 'Kahlene' AM/ANOS. *Dendrobium* Yarra Song 'Peaches and Cream' and *D.* David Adams 'Golden Lanterns' have 38% and 25 % *D. kingianum* respectively, and their appearance is strongly in the *D. kingianum* style. *Dendrobium* King-Wong, *D.* Yondi and *D.* Suffusum received AD or ACC/ANOS with some that might have been close to a quality award.

There are no *D.* Delicatum awards and only one *D.* Bardo Rose has received an ANOS award. In the 1980s and

Figure 1. Early *Dendrobium kingianum*-style hybrids and some specimen plants

Dendrobium Delicatum 'Mona Vale Show'

Dendrobium Victorian Flare 'Solid Violet Lip'

Dendrobium Tyabb 'Jarrah'

Dendrobium Tyabb 'Jarrah'

Dendrobium Australian Rhubarb Pie 'Kahlene' AM-AOC/ANOS 2018 (Vic.)

Dendrobium Australian Rhubarb Pie 'Kahlene' AM-AOC/ANOS 2018 (Vic.)

Figure 2. *Dendrobium kingianum*-style early hybrids

Dendrobium Bardo Rose

Dendrobium Suffusum

Dendrobium Hastings 'Beilby'

Dendrobium Delicatum 'Purple'

1990s there were frequent superb specimen-size plants of high quality in provincial areas of New South Wales and Victoria but no ANOS judging panels available to award them. Judges and growers in New South Wales may be able to comment on the low number of awards in that early wave of *D. kingianum*-style hybrids, the most popular hybrids at the time.

There has been a decrease in breeding *D. kingianum*-style hybrids in recent decades, which may partially account for low numbers of awards since 2000. The most obvious factor in the low number of awards has been the difficulty in bringing panels to assess the potential award plants at the best time. There was no ANOS panel in Victoria until recent years and there are effectively none in several states and distant provincial centres.

Australian Orchid Council Awards for *Dendrobium kingianum*-Style Hybrids

There have been 1081 quality awards for *Dendrobium*. Of these, 539 are hybrids with 141 containing *D. kingianum*. Of the 141, around 39 have a strong *D. kingianum* influence with the species background ≥50% (Table 6). In this group there have been six AMs and 33 HCCs. Hybrids containing < 50% *D. kingianum* have received 102 awards, including six FCCs (Table 7), 35 AMs and 62 HCCs. The chronology of the awards for the *D. kingianum*-dominated hybrids (39) shows a strong peak in the period 1990-2009 followed by a sharp decline, with no awards since 2016. Overall, the frequency of *D. kingianum*-style hybrid awards by AOC is very low and has progressively declined since 2009.

Hybrid	Parentage	% *D. kingianum*	Award
D. Yondi Brolga 'Yondi'	*D. kingianum* x Peach Glow	62	HCC/ANOS 1995
D. Tyabb 'Jarrah'	*D.* Cobber x Victoria Flare	63	HCC/ANOS 2013
D. Bardo Rose 'Super'	*D. kingianum* x *falcorostrum*	50	HCC/ANOS 2016
D. Yarra Moon 'Butterfly'	*D. kingianum* x Jesmond Gem	62	HCC/ANOS 2016
D. Australian Rhubarb Pie 'Kahlene'	*D.* Victorian Bride x Cobber	44	AM/ANOS 2018
D. Yarra Song 'Peaches and Cream'	*D.* David Adams x Les Adams	38	HCC/ANOS 2018
D. David Adams 'Golden Lanterns'	*D.* Yondi x Eureka	25	HCC/ANOS 2018
D. King-Wong 'Striker'	*D. kingianum* x Wonga	62	AD/ANOS 1993
D. Yondi 'Kayena'	*D. kingianum* x Eureka	50	AD/ANOS 1995
D. × suffusum	*D. kingianum* x *gracilicaule*	50	ACC/ANOS 2003

Table 5. ANOS Awards for *Dendrobium kingianum* dominant hybrids.

% *D. kingianum* in background	No. awards	Influence of *D. kingianum*
>50%	16	usually apparent
50%	23	usually apparent
>25% – <50%	27	variable, usually small
25%	26	variable, usually small
>12.5% – <25%	15	no influence discernible
12.5%	11	no influence
3% – < 12.5%	23	no influence

Table 6. Australian Orchid Council Awards for *Dendrobium kingianum* hybrids (total 141 plants).

% *Dendrobium kingianum* in background	Hybrid	Date of Award	Exhibitor	Comment
25%	*D.* Samford Rose	2017	A. Blewitt	*D. bigibbum* dominant
25%	*D.* Jesmond Gem 'Olive Adams'	2004	P. & S. Adams	Some *D. kingianum* influence apparent in flowers
25%	*D.* Jesmond Gem 'Apricot Pie'	2014	P. & S. Adams	Some *D. kingianum* influence apparent in flowers
21.9%	*D.* Tosca 'Jean'	2015	T. Milton	No *D. kingianum* influence apparent
6%	*D.* Yondi Tina 'Goliath'	1999	B. Fletcher	No *D. kingianum* influence apparent
3%	*D.* Australian Goldrush 'Sydenham'	2010	M. Drobski	No *D. kingianum* influence apparent

Table 7. Analysis of Australian Orchid Council FCC awards to *D. kingianum* hybrids.

Year	Total Quality Awards	FCC	AM	HCC	% *Dendrobium speciosum* in hybrids	% *Dendrobium speciosum* in most hybrids
2019	5	0	3	2	53 – 93	>80
2018	18	2	15	1	50 – 81	>70
2017	8	0	6	2	56 – 87.5	>60
2016	7	1	4	2	50 – 87.5	>60
2015	4	0	0	4	50 – 75	>55
2014	10	3	2	5	50 – 87.5	>55
2011 – 13	16	1	10	5	50 – 87.5	>53
2005– 10	21	1	6	14	50 – 87.5	>55
2000– 4	21	1	3	17	50 – 75	most 50
1990– 9	30	0	4	26	50 – 75	most 50
1982– 9	4	0	1	3	50	50%

Table 8. Australian Orchid Council quality awards for *Dendrobium speciosum* hybrids.

Factors may include a decline in growing this style of plants, with a preference for the *D. speciosum* style and for some reluctance of panels to award plants with smaller pastel coloured flowers and lower counts on a raceme. The problems of presenting plants to panels is also relevant, although there are many more AOC panels than in the ANOS system. There have been some high-quality plants that have received an ANOS or AOC award but not both, and in this sense, the two systems may be in competition with each other.

Australian Orchid Council Awards for *Dendrobium speciosum*-Style Hybrids

There are 328 quality awards to hybrids containing *D. speciosum* compared with 141 containing *D. kingianum*. There are 145 registered hybrids with ≥ 50% background *D. speciosum* compared with 39 hybrids with ≥50% *D. kingianum*. Since the first quality awards for *D.* Hilda Poxon and *D.* Delicatum, there has been an increasing number of awards for quality, and a progressive increase in higher quality awards (AM and FCC), now constituting the majority (63%) of awards since 2011 (Table 8). Since 2016, these constitute 84% of quality awards. There has been an increasing background percentage of *D. speciosum* in awarded hybrids, with >70% since 2018, >60% for 2016– 7, and before then >55%, and with most >50% back to 1990.

In the early decades of breeding *D. speciosum* hybrids most quality awards were HCC, but after 2010 this changed in favour of higher quality awards. Improvement in flower and plant quality are undoubtedly a major factor. Increases may also be related to judging at special events such as the Kempsey Speciosum Spectacular which is held at a peak flowering time for hybrids. Some growers and breeders choose not to accept an HCC award and prefer to wait until their plants are judged worthy of higher awards.

Table 5 shows the ANOS awards for *D. kingianum*-dominant hybrids and Table 6 shows the AOC awards for *D. kingianum*-dominant hybrids. In the ANOS system there is a much smaller number of quality awards for *D. kingianum*-dominated hybrids compared with *D. speciosum*-dominated hybrids. Overall, the trends and frequency of awards is clearly in the direction of *D. speciosum*-style hybrids.

Discussion

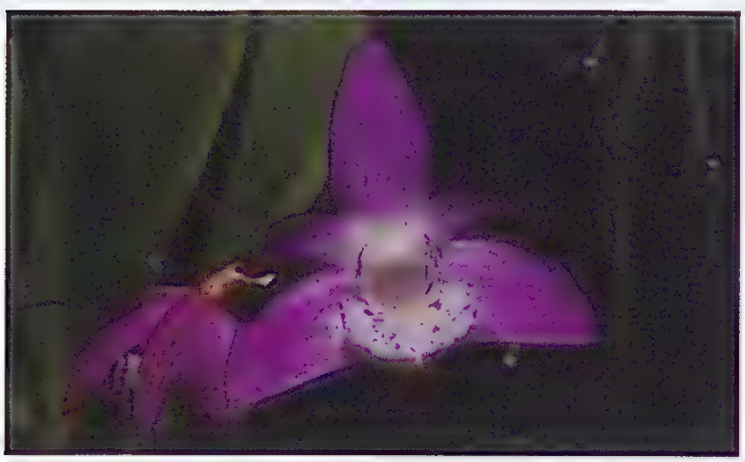
Analysis of hybrid breeding and quality awards clearly show the trend of increasing use of *D. speciosum* to produce cream-yellow-gold flowers in *Dendrobium* hybrid lines. There is a relatively small and declining use of *D. kingianum*. The main goal of much breeding is to achieve award quality seedlings even if the time to optimum display is longer, as it often is in *D. speciosum* hybrids. Success is likely with all main styles, that is, *D. speciosum*, *D. tetragonum* and *D. kingianum*. A balanced breeding approach to create more variety in all styles is a worthwhile goal.

One key advantage of ANOS judging is that all styles are appreciated and awarded when optimums are achieved. *Dendrobium speciosum* has the most flowers per raceme in *Dendrobium* and it is the choice in breeding to significantly

Figure 3. *Dendrobium kingianum*-style hybrids and *Dendrobium kingianum* breeding plants

Dendrobium David Adams 'Golden Lanterns' HCC/AOC-ANOS 2018 (Vic.)

Dendrobium Yarra Song 'Peaches and Cream' HCC-AD/ANOS 2018 (Vic.)



Dendrobium Yondi 'Marcus'

Dendrobium Yarra Mist

Dendrobium kingianum 'Pale Dragon' AM/AOC 2003 (Vic.)

Dendrobium kingianum 'Red Mug'

Dendrobium kingianum 'Casgara'

Dendrobium Moorking

Figure 4. *Dendrobium kingianum*-style hybrids - purple and mauve flowers

Dendrobium Bounty 'Freckles'

Dendrobium Cracker

Dendrobium Julia 'So Bold'

Dendrobium Tyabb x *Dendrobium* Desert Rose

Dendrobium Desert Rose

Dendrobium Bicentennial Rose x *Dendrobium* Esme Poulton

increase floriferousness and number of flowers on a raceme. All styles are most likely therefore to be crossed back to *D. speciosum*, hoping that the positive features of the other species are not lost. Increased size of plants and slowness to flower are the negatives of this trend.

There is an argument that breeders should be encouraged to diversify their approaches to breeding to create more interesting and more varied hybrids, recognising that orchid growing as a hobby is contracting rather than expanding, space for orchid houses is reducing, growers are getting older and can't handle large-growing plants. If we are restricted to ANOS-eligible species how can this be achieved? New South Wales has the most suitable climate for raising *Dendrocoryne* seedlings to flowering size in minimum time. A return to higher activity levels with this section, as occurred in the latter decades of the 20th century on the mid-north coast with the Hastings Kingianum Growers Group, Merrellen Orchids, DUNO and the Newcastle breeders would be a positive development. In Victoria, there has been some innovative breeding in Gippsland, for example, by Phil Grech and others (Grech 2019).

Perhaps breeders could be encouraged to be more innovative and experimental. This may involve going back to the beginning and starting with crosses and remakes of primary and later hybrids using smaller *Dendrocoryne* species, including shorter forms of *D. kingianum*, and species from other *Dendrobium* sections. There will be challenges – some miniature *D. kingianum* are generally less floriferous, and there will be reduced compatibility and fertility when attempting crossings with other *Dendrobium* sections. However, the results may be worthwhile if the variety of hybrids can be expanded, and this may engage more growers in growing ANOS-eligible plants, as many growers now look for unusual or miniature orchids.

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ANOS awards online https://anos.org.au/awards-selection

AOC awards online https://www.orchidsaustralia.com.au/index.php/judging-awards

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Prasophyllum R.Br. Taxa of the Granite Belt, Queensland

Text and Photos David James | davidljames@bigpond.com

Summary

Observations of species and unidentified taxa of *Prasophyllum* R.Br. in the Granite Belt were made over 14 years. The commonest *Prasophyllum* is unidentified. Flowering of some of the variants is spasmodic with some flowering only once in the study period. Seasonal climate effects may contribute to variations in floral form. Locating and monitoring plants over several seasons can be difficult.

Introduction

The Granite Belt in Queensland is the Stanthorpe Plateau sub-region of the New England Tablelands biogeographic region. The Granite Belt is a roughly rectangular area from the bulge in the border between Queensland and New South Wales north to about three-quarters of the way from Stanthorpe to Warwick and west to just west of Ballandean. There are a few *Prasophyllum* taxa that occur naturally on the Granite Belt. A number of these appear to be undescribed, in particular the most commonly occurring one.

The Genus *Prasophyllum*

The genus was established by Robert Brown in 1810 based on *P. australe* R.Br. There are around 140 species occurring mainly in southern Australia and a small number in New Zealand. There are endemic Australian species still to be named. Plants have a thin hollow leaf through which the flower stem breaks. It bears usually numerous, often fragrant, dull-coloured flowers with green, brown and purple hues. Pollination is mainly by wasps and bees.

The Species

I am interested in observing *Prasophyllum* in the Granite Belt - when they flower, where they grow and the variations in flowers from year to year (season to season). The four species I have seen in the last 14 years are:

1. *Prasophyllum australe* R.Br found in a colony.
2. *Prasophyllum flavum* R.Br. found as solitary plants.

Plate A. *Prasophyllum australe*
30 November 2013

Plate B. *Prasophyllum flavum*
3 November 2013

Plate C. *Prasophyllum* sp. aff. *dossenum*
8 December 2007

Plate D. *Prasophyllum* sp. aff. *dossenum*
8 December 2007

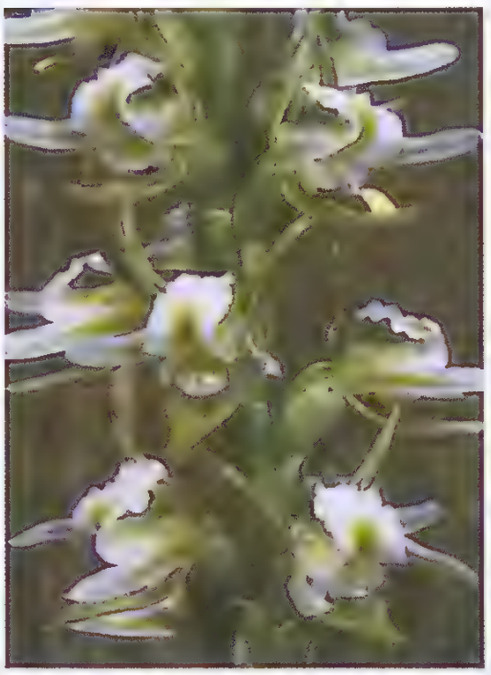

Plate E. *Prasophyllum* sp. aff. *dossenum*
22 November 2008

Plate F. *Prasophyllum* sp. aff. *dossenum*
18 November 2015

3. A possibly undescribed *Prasophyllum* that flowers from mid-November to early December; grows along the edge of granite swamp habitat and is found in loose colonies that could be termed *P. sp. aff. dossenum* (Granite Belt) (*P. dossenum* R.J.Bates & D.L.Jones) (Lachlan Copeland, northern New South Wales botanist, pers. comm.)

4. A possibly undescribed *Prasophyllum* that flowers in late October to early December, grows in forest habitat and is found mainly as solitary plants. This was the first species that I photographed. At the time I tried to identify it, but I could not find anything that was a good match. The closest was *P. sp. aff. odoratum* (*P. odoratum* R.S.Rogers). One of the plants has an interesting feature to the lateral sepal tips.

Photographs of the species and their variants are presented in Plates A – L.

Observations

Prasophyllum australe

I have seen one colony of *P. australe* which was growing on the edge of a granite swamp habitat. The reason the colony was found was that some of the plants flowered after a fire the preceding summer. This flowering was in late November to early December and the flowers were photographed on 30 November. Some of the plants initiated flowering in a subsequent year (four years later) but the flowers did not open. They basically just cracked but did not open any further before they withered. This could have been an impact of the warm to hot and dry weather leading up to and around flowering time. There were no other plants of this or other *Prasophyllum* taxa growing around this particular granite swamp habitat and no others have been found since the flowering six years ago.

Prasophyllum flavum

I have seen two plants of *P. flavum*. Both were in forest habitat at the very top of a gully. One locality had grassland close by. The plants were solitary with no other plants in the area. They flowered in late October to early November. Interestingly the plant leaves or flowers have not been seen again in the last six years since they flowered.

Unidentified *Prasophyllum*

The most common *Prasophyllum* of the Granite Belt I have observed is a species that grows on the edges of the granite swamp habitats in loose colonies. There are generally tens of flowering plants scattered over areas of around 10 m^2. I have seen these plants in two different granite swamp areas over four ocassions from 2007-16. I know of other similar granite swamp localities which are not as accessible that could be hosts for this species. I have seen these plants in flower from mid-November to early December. No other *Prasophyllum* plants (flowers) have been seen in the area of these plants. An interesting feature

Plate G. *Prasophyllum* sp. aff. *dossenum*
27 November 2016

Plate H. *Prasophyllum*
26 October 2014

Plate I. *Prasophyllum*
30 October 2005

of these flowers is that the tips of the lateral sepals do not have a single point like the other local *Prasophyllum* taxa (Plate D). This could be what Tony Bishop (1996) termed "with a tiny tooth close to the fleshy tip" in his description for *P. dossenum*. This "tooth", the gibbous base to the lateral sepals (i.e. a kink at the base of them) and the broad labellum is probably the basis for Lachlan Copeland suggesting that this species could be termed *P. sp. aff. dossenum* (Granite Belt). Lachlan had a more locality specific term which I have altered to the more general locality of Granite Belt to protect the location. He has only seen photographs of the flowers, so a more definitive identification was not possible without field observations. He indicated they were most similar to *P. dossenum* and *P. pictum* D.L.Jones & L.M.Copel. but matched neither.

The first flowering *Prasophyllum* I saw on the Granite Belt was in late October 2005. It was growing in forest habitat and was solitary. There were no other plants, leaves or flowers, in the area. The next time a flowering plant was seen at this locality was eight years later. During this period a fire burnt out the fallen tree near the *Prasophyllum* (the reference for locating the plant). I am fairly sure the single plant that flowered eight years later was within one or two metres of the previous flowering plant. Again, no other plants, leaves or flowers, could be located in the area.

The next year two flowering plants were found at the location. These plants were 150–200 mm apart. One plant had flowers with some brown markings, but the other had flowers that were green with darker green stripes and white. The lateral sepals of the flower lacked the brown marking and also had the tooth close to the tip (Plate H).

With reference to Plates I, J, K and L you would think you were looking at different species of *Prasophyllum*. These are generally the flowers of solitary plants that occurred at a similar location over a nine year period. The 2005 flower had a broad labellum with a pinched middle section, widely spreading horizontal petals and a broad, rounded and flat dorsal sepal. The 2013 flower had a less broad, slightly pointed and flatter labellum, hooked horizontal petals (not widely spreading) and a pinched and flat dorsal sepal. The 2014 flower with the brown markings (Plate K) had the most pointed flat crispate (wavy) labellum, somewhat spreading, non-horizontal, petals and a pinched and hooded dorsal sepal. The other 2014 flower was green with darker green stripes and white labellum and petal tips and had the most pointed and crispate labellum, widely spreading horizontal petals with a pinched and flat dorsal sepal.

Discussion

Some features of these four flowerings are similar, but none are consistent from flowering year to year. For example, the widely spreading horizontal petals occurred in the flowering in 2005 and one of flowering plants in 2014 (the green flower with darker green stripes and white labellum and petal tips). Because the plants occurred in a similar location, I assumed they were a similar plant, but this may not be the case.

Plate J. *Prasophyllum*
20 October 2013

Plate K. *Prasophyllum*
26 October 2014

Plate L. *Prasophyllum*
26 October 2014

A concerning aspect is that the flower forms have only been seen once in the last 14 years. If the same plant flowered more than once I would expect the flower form to be at least similar. This could mean the plants have not flowered again in this period.

This is what makes studying geophytic orchids (terrestrials) so interesting. As the plants are under the surface and reproduce by at least tuberoid replacement they may not arise in exactly the same location from year to year. Therefore, you cannot be sure which plant is flowering from year to year. I have always been afraid of putting a plastic flag marker on a wire near plants. My fears have been that I may push the wire through a tuberoid, or the public may dig around trying to work out what the marker is marking or are mischievous and move the marker.

Lachlan Copeland suggested they were not a good match for *P. dossenum, P. odoratum, P. patens* R.Br., *P. pictum* or *P. spicatum* R.J.Bates & D.L.Jones. He did suggest they may be a hybrid between *P. sp. aff. odoratum* and *P. australe* because they have features of both, however *Prasophyllum* hybrids are uncommon. If they were different hybrid plants flowering in different years, it may explain the variability of the flower forms seen from year to year.

I wonder if seasonal variations affect the flower form, for example, if the weather is warm to hot and dry during the growing to flowering season the flower segments may not open as flat and/or horizontal. This would go some way to explaining the labellum being pinched or flat, pinched dorsal sepals and widely spreading or not petals as I think it unlikely that four different solitary *Prasophyllum* species could grow at the same spot and flower just once in a 14-year period. I wish I could locate the 2005 plant again because it had such open, full shaped and flat flowers.

A number of researchers are investigating *Prasophyllum* taxa with a review of the genus and description of new species. It may be some time before the Granite Belt taxa are identified.

Acknowledgements

Thanks to Lachlan Copeland, botanist, for help with identification.

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David James is the ANOS Inc. Regional Registrar for the Northern Region (Queensland and far north coast of New South Wales) and has a keen interest in terrestrial orchids.

Dendrobium Hawaii Spectacular and *Dendrobium* Sherry Abe

Text By Roslyn Capell | capell666@ozemail.com.au

Sub-Tropical Orchid Council Show 2019

The Sub-Tropical Orchid Council of Queensland held its triennial orchid show and conference at Rockhampton in September 2019. The venue was excellent, and the show and lectures were of high quality and well worth the trip. To top it off, the Grand Champion orchid was an Australasian hybrid: *Dendrobium* Hawaii Spectacular 'Marilyn'. The panel of Australian Orchid Council judges awarded the plant a Highly Commended Certificate, and gave its grower, Jeff Bloxsom, an Award of Cultural Commendation. The previous week *Dendrobium* Sherry Abe 'Pink Champagne' owned by John Robertson had received an Award of Distinction at Nambour Orchid Society's Spring Show.

Dendrobium Hawaii Spectacular is *D.* Big Alex x *D. spectabile*, registered in 2013. *Dendrobium* Big Alex is *D. alexandrae* x *bigibbum,* registered in 2002. *Dendrobium* Sherry Abe is *D.* Peter Shen x *D. spectabile*, registered in 2015. *D.* Peter Shen is *D. alexandrae* x *D. phalaenopsis*, registered in 2010.

Dendrobium phalaenopsis is now accepted by the World Checklist of Selected Plant Families, maintained by the Royal Botanic Gardens at Kew, as being synonymous with *Dendrobium bigibbum*, specifically *D. bigibbum* var. *superbum*. According to Article 4.3 of the *International Code of Nomenclature for Cultivated Plants – Ninth Edition*, when the name of one or more of the component parents of a grex is considered to be a synonym of another, the earliest established name for the grex is to be used. *Dendrobium* Big Alex was registered before *D.* Peter Shen and it therefore should be used instead of *D.* Peter Shen. It follows that the name *D.* Hawaii Spectacular should be used for plants labelled *D.* Sherry Abe. It is likely that we will continue to see some plants labelled as *D.* Hawaii Spectacular and some labelled as *D.* Sherry Abe. Whatever name is used for this hybrid, the breeding has resulted in some very attractive hybrids which combine the interesting and desirable features of section *Latouria* species and section *Phalaenanthe* species, and the flowers can remain in good condition for many weeks.

Dendrobium bigibbum is dominant for colour, and that feature is evident in these hybrids, although the *Latouria* species seem to have influenced the shade or tone of purple in the flowers of some plants. Award descriptions note a range of colours from greyed-purple to violet-red to lavender, rose-red, pink, fuchsia, magenta, burgundy-purple and old rose. All plants of *D.* Hawaii Spectacular and *D.* Sherry Abe that I have seen at shows or in award photographs have had a white background overlaid on the petals and sepals with varying shades and densities of deep pink or purple and with deeper colour on the labellum. The flowers of *D.* Sherry Abe have tended to have less of the pink/purple colouring than *D.* Hawaii Spectacular, and consequently more white areas, but in *D.* Sherry Abe 'Pink Champagne' the colour distribution is distinctive and the overall impression is of white flowers with pink markings.

Awards

There have been nine quality awards granted to *D.* Hawaii Spectacular by the American Orchid Society and one Award of Distinction, and three AOS quality awards to *D.* Sherry Abe. *Dendrobium* Hawaii Spectacular 'Marilyn' had 10 inflorescences with 85 flowers and one bud, an average of 8.6 flowers per inflorescence with 11 on the main one, and the flowers were 81mm wide. The flower count for the AOS awards for this grex averaged 8.1 flowers and buds per inflorescence though the range for individual awards was from 6 to 12. AOS-awarded flowers had an average 80mm median natural spread with the largest being 95mm wide. *D.* Sherry Abe 'Pink Champagne' had five inflorescences with a total of 22 flowers and 11 buds, the main inflorescence having six flowers and two buds, and the flowers were 85mm wide. For AOS awards to *D.* Sherry Abe, the average was 6.8 flowers and buds with a range of 5.7 to 8, with an average median natural spread of 91.3mm and the largest being 100mm wide.

So far neither *D.* Hawaii Spectacular nor *D.* Sherry Abe has any registered progeny but both *D.* Big Alex and *D.* Peter Shen are parents of other crosses.

Dendrobium spectabile Photo R. Capell

Dendrobium alexandrae Photo R. Capell

Dendrobium bigibbum Photo R.Capell

Dendrobium Hawaii Spectacular 'Marilyn' Photo R. Capell

Dendrobium Hawaii Spectacular 'Marilyn' single flower Photo R. Capell

Dendrobium Sherry Abe 'Pink Champagne' flower Photo C.McMonagle

Dendrobium Sherry Abe 'Pink Champagne' AD/AOC 2019 (Qld) plant
Photo C.McMonagle

Dendrobium Sherry Abe Photo R. Capell

Dendrobium Peter Shen Photo R.Capell

Dendrobium Hawaii Spectacular 'Marilyn' HCC-ACC/AOC 2019 (Qld)
Photo. R.Capell

D. Big Alex x *D. alexandrae* = *D.* Lavender Star

D. Big Alex x *D.* Silver Wings = *D.* Fire Wings

D. Peter Shen x *D.* Roy Tokunaga = D. Lucky Charms

D. Peter Shen x *D.* Little Atro = *D.* Memoria Carol Jean Clark

D. Peter Shen x *D.* Silver Wings = *D.* Silver King

D. Peter Shen x *D.* Hisako Haraguchi = *D.* Crystal Rose

Plants of each of these grexes have been awarded by the American Orchid Society and all have the same general shape as *D.* Hawaii Spectacular and *D.* Sherry Abe, though with some differences in size and other features. They all have a white or cream base colour with varying amounts of pink/purple markings, and even green in a few cases.

The Spring 2020 H & R Orchids catalogue tells us that *D.* Peter Shen has also been crossed with the *Phalaenanthe*-style hybrid *D.* Nida and with the *Spatulata*-style hybrid *D.* Blue Twinkle. *D.* Nida contains small amounts of various sect. *Spatulata* species and *D. bifalce*, but is more than 70% *D. bigibbum* (as *D. phalaenopsis*) so its progeny with *D.* Peter Shen are likely to appear similar to the hybrids mentioned above. However, *D.* Blue Twinkle is 50% *D. canaliculatum* and contains significant amounts of *D. lineale*, *D. gouldii* and also some *D. nindii*. Its progeny with *D.* Peter Shen will be about 45% sect. *Spatulata*, 28% *D. bigibbum* and 25% *D. alexandrae* and I look forward to seeing what this blend of genes produces.

Acknowledgements

Thanks to John Rees, Australian Orchid Council National Registrar of Judges, for permitting the use of the award photographs of *D.* Sherry Abe 'Pink Champagne' taken by Charlie McMonagle.

Roslyn Capell is an ANOS and AOC judge.

373 *Dendrobium wassellii* 'Port Hacking' HCC/ANOS 2019 (NSW)

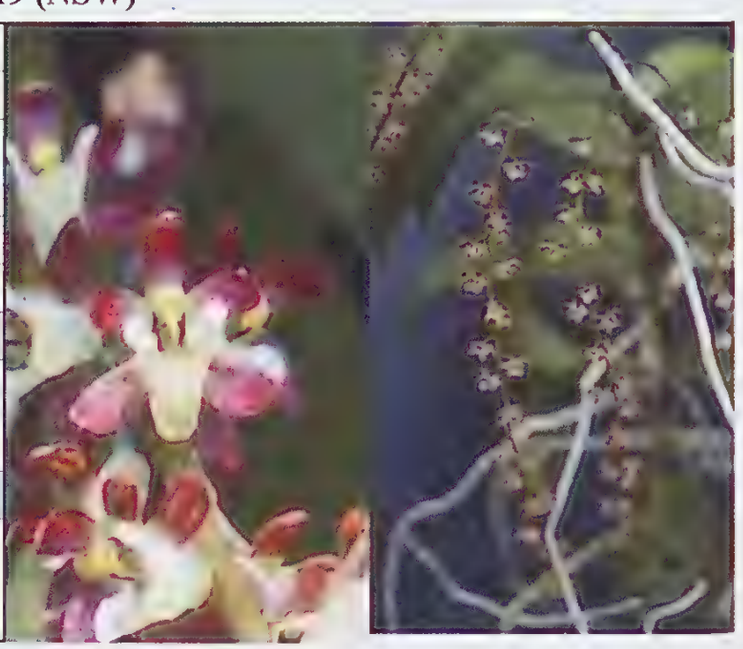
Points	77.50
Owner	Chalmers, I. & I.
Date & Event	1 December 2019
Photos By	Ian Chalmers
#Flowers/inflorescences	380 & 26 buds / 17
Measurements (mm):	
Flower: across 28, vert. 20 Petal: 23L, 1W Sepal: 11.15L 2.25W	Dorsal: 14L 2.2W Labellum: 4.76L 4W Inflorescence Length: 154
Detailed avg. points:	
Shape (25): 18.75 Colour (20): 16.1 Size (15): 12.3	Substance/Texture (10): 7.5 Floriferousness (15): 11.55 Habit/Attractive (15): 11.3

#374 *Dendrobium wassellii* 'Widgun' HCC/ANOS 2019 (NSW)

Points	80.30
Owner	Clarke, Tony
Date & Event	1 December 2019
Photos By	Ian Chalmers
#Flowers/inflorescences	226 & 35 buds / 11
Measurements (mm):	
Flower: across 9.09, vert. 8.3 Petal: 12.34L, 1.5W Sepal: 12L, 0.5W	Dorsal: 12.37L, 2W Labellum:6L, 3.3W Inflorescence Length: 162
Detailed avg. points:	
Shape (25): 19.2 Colour (20): 17.4 Size (15): 11.8	Substance/Texture (10): 7.8 Floriferousness (15): 12.1 Habit/Attractive (15): 12

#375 *Peristorrhiza* Surreal 'Belmont' AM/ANOS 2019 (NSW)

Points	80.91
Owner	Fitsimmons, Colin
Date & Event	1 December 2019
Photos By	Ian Chalmers
#Flowers/inflorescences	135 / 6
Measurements (mm):	
Flower: across 7.5, vert. 6.5 Petal: 3.2L, 1.2W Sepal: 3.5L, 1.3W	Dorsal: 3.5L, 2.1W Labellum: 2.5L, 4W Inflorescence Length: 136
Detailed avg. points:	
Shape (25): 20 Colour (20): 17.16 Size (15): 12.08	Substance/Texture (10): 8 Floriferousness (15): 12 Habit/Attractive (15): 11.66



#376 *Caladenia filamentosa* 'Morning Glory' CBR/ANOS 2019 (NSW)

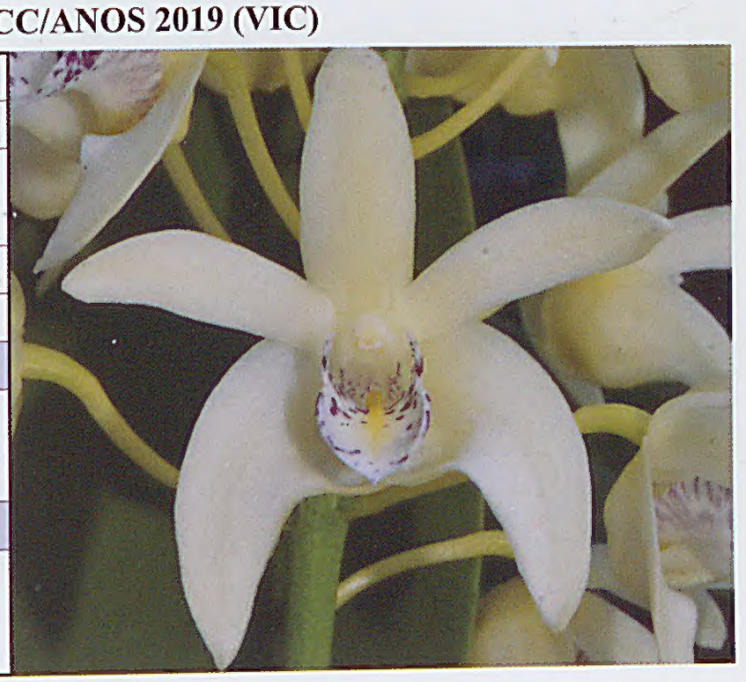
Points	
Owner	Wheeler, Nita
Date & Event	13 September 2019
Photos By	Bill Dobson
#Flowers/inflorescences	6 / 3
Measurements (mm):	
Flower: across 82, vert.115 Petal: 88L, 3W Sepal: 95L, 3W	Dorsal:87L, 3W Labellum: 5L, 5W Inflorescence Length: 270
Detailed avg. points:	
Shape (25): Colour (20): Size (15):	Substance/Texture (10): Floriferousness (15): Habit/Attractive (15):

#377 *Dendrobium* Anthedon Splendour 'Rainforest Rhapsody' ACC/ANOS 2019 (NSW)

Points	85.00
Owner	Moore, Barry
Date & Event	31 August 2019
Photos By	Bill Dobson
#Flowers/inflorescences	728 & 6 buds / 104
Measurements (mm):	
Flower: across 53, vert. 38 Petal: 36L, 3W Sepal: 32L, 4W	Dorsal: 32L, 4W Labellum: 12L, 7W Inflorescence Length: 130
Detailed avg. points:	
Shape (25): Colour (20): Size (15):	Substance/Texture (10): Floriferousness (15): Habit/Attractive (15):

#378 *Dendrobium* Yarra Star 'Lemon Meringue' HCC/ANOS 2019 (VIC)

Points	78.80
Owner	Adams, Peter & Sheryl
Date & Event	23 October 2019
Photos By	Peter Adams
#Flowers/inflorescences	123 / 7
Measurements (mm):	
Flower: across 42, vert. 33 Petal: 25L, 5W Sepal: 15L, 12W	Dorsal: 28L, 13W Labellum: 10L, 14W Inflorescence Length: 260
Detailed avg. points:	
Shape (25): 19.4 Colour (20): 15.8 Size (15): 12.2	Substance/Texture (10): 7.6 Floriferousness (15): 12 Habit/Attractive (15): 11.8



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#379 *Dendrobium rigidum* 'Jardine River' ACC/ANOS 2019 (QLD)

Points	80.80
Owner	McNaught, Bill & Hepworth, Alison
Date & Event	22 March 2019
Photos By	Graham Corbin
#Flowers/inflorescences	199 & 6 buds / 56
Measurements (mm):	
Flower: across 11, vert. 10 Petal: 7L, 4W Sepal: 7L, 4W	Dorsal: 10L, 3W Labellum: 7L, 3W Inflorescence Length: 17
Detailed avg. points:	
Shape (25): Colour (20): Size (15):	Substance/Texture (10): Floriferousness (15): Habit/Attractive (15):

#380 *Dendrobium* White Grace 'Sato' HCC/ANOS 2019 (QLD)

Points	75.30
Owner	Berry, Peter
Date & Event	19 September 2019
Photos By	Graham Corbin
#Flowers/inflorescences	70 & 13 buds / 8
Measurements (mm):	
Flower: across 61, vert. 59 Petal: 32L, 14W Sepal: 35L, 13W	Dorsal: 33L, 14W Labellum: 29L, 15W Inflorescence Length: 310
Detailed avg. points:	
Shape (25): 19.7 Colour (20): 15.6 Size (15): 11.2	Substance/Texture (10): 7 Floriferousness (15): 11 Habit/Attractive (15): 10.6

#381 *Dendrobium* Memoria Ellwyn Gleadhill 'Minnie' AM/ANOS 2019 (QLD)

Points	81.20
Owner	Elms, Don
Date & Event	1 November 2019
Photos By	C. McMonagle
#Flowers/inflorescences	123 & 28 buds / 10
Measurements (mm):	
Flower: across 61, vert. 50 Petal: 32L, 9W Sepal: 37L, 11W	Dorsal: 31L, 12W Labellum: 21L, 18W Inflorescence Length: 345
Detailed avg. points:	
Shape (25): 20.2 Colour (20): 16.9 Size (15): 11.4	Substance/Texture (10): 8.1 Floriferousness (15): 12 Habit/Attractive (15): 12.6

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Dendrobium spectabile Photo R. Capell